The

Electrical Review

VOL. CI. DECEMBER 30, 1927. No. 2,614.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

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Telegraphic Address: "AGEEKAY, CENT., LONDON," Code, A B C. Telephone No.: Central 7072 (Three Lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

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Retrospect and Prospect.

THE temptation to indulge in lengthy retrospection, once the annual editorial habit, has to be resisted in these days. In former times when electrical developments were more leisurely many events and things seemed large which now are of no more importance than every-day occurrences. The review of the year was then elaborate, and to make it complete was an arduous piece of work; to cover a year's progress at the present rate of movement, in such a manner as formerly, would be puzzling to the writer and wearying to the reader. The chronicler has to be content with brief mention of a few outstanding or typical events, or tendencies, for he and his readers alike know that it is more helpful to look forward than backward.

We began the year 1927 on an optimistic note, and so we have continued until these closing days. Yet we knew as we started out that both nationally and electrically we must continue to pay the bill for the ruinous industrial strife of 1926. We hoped that the burden of unemployment which hung so heavily about our necks would be lightened, but no very early absorption of the 1,357,000 unemployed could be anticipated. The figures have fallen by something between 200,000 and 300,000, and there has been a shifting of some of the centres of work which may ultimately bring a greater measure of relief. These statistics are national, and they do not possess special significance for the electrical trade; they do not indicate what has been happening in the electrical industry, though it is certain that if the trades that these unemployed represent had progressed so as to be able to absorb them, the beneficial effect upon the electrical industry would have been direct and very real.

In respect of electricity supply, the year has been unquestionably an important one. It opened in the midst of the E.D.A.-E.L.M.A. campaign, which helped the popularising movement. As it closes, we are finishing the first half of the Circle Campaign, which continues

to carry on the same good work. Charges for electricity, raised during the strife in the coal industry, have been returning to pre-strike figures, and domestic progress has been proceeding at a satisfactory rate.

January, 1927, also brought into operation the new Electricity (Supply) Act, and as the year has passed many have been the new developments, conferences, and controversies to which its provisions have given rise. The Central Electricity Board, admirably constituted to fulfil its important functions, has organised a staff of no less merit, and has already commenced operations in Central Scotland, the first big contract being entrusted to a British company early this month; we may confidently expect to record material progress in that area by the end of the coming year, but the scheme that has been published for the reorganisation of the South-Eastern Counties has met with opposition so vigorous that delay in putting it into operation is inevitable. Incidentally, in accordance with the policy embraced by all parties of developing the supply of electricity in rural areas, this journal embarked upon a campaign directed towards the removal of restrictions on the erection of overhead lines which resulted in the formation of that energetic body styled the "Overhead Lines Association," and the Electricity Commissioners, in full sympathy with the movement, have set on foot extensive investigations with the same object in view. Considerable progress has also been made in the erection of large power stations which will take their places in the national scheme as time goes on.

Heroic, and we trust successful, efforts have been made to introduce measures of agreement between contracting and supply interests, and the stabilisation for the whole of 1928 of wages and conditions for certain grades of workers in the supply industry should prove beneficial.

In the manufacturing industry itself there has been an increasing tendency toward amalgamation or co-operation in some leading branches, though such efforts have not been conspicuously successful in others—one in particular, if rumour be correct. Electrical export trade has been a bright spot, and there has been considerable advance in its value, but, unfortunately from some points of view, there has been a larger advance in electrical imports.

One of the most notable events in the history of telegraphy was the opening of commercial wireless communication between Great Britain and Australia on the "beam" system, early in the year, followed by further developments, which have brought wireless and cable telegraphy into acute competition. Both types are essential to the national and Imperial welfare, and the controversial questions which have arisen are now receiving serious consideration on the part of the Government and the companies concerned. Telephonic communication on the "beam" system with Canada was also inaugurated, and will doubtless be extended to other Dominions. The broadcasting service has made great progress, as well as the apparatus employed in connection with it, and further developments of fundamental importance are in prospect.

The electrification of railways has been almost at a standstill during the year, but a start has been made with the conversion of the South London (L.B. & S.C.) lines from a.c. to d.c. operation, which will lead to complete uniformity throughout the system of the Southern Railway Company.

We look forward with confidence to 1928, and wish all our readers and supporters a happy, busy, and prosperous year.

The Wrongful Use of Titles.

THE action taken by the Council of the Institution of Electrical Engineers, which was reported on p. 1033 of our issue of December 16th, will be noticed with interest and appreciation by members of the Institution. Such actions are very rare—we believe this is the first instituted by the I.E.E. in this country—and we hope that the chief reason for their rarity is the lack of occasion for them; but there are grounds for suspecting that the misuse of the initials representing the corporate classes of membership is increasing, and this action may be taken to imply that the Council is determined to protect the interests of the members by putting a stop to such practices. A similar case occurred in New Zealand two years ago, when the local Hon. Secretary of the I.E.E. prosecuted a person for improperly using the letters "A.M.I.E.E.," and the offender was fined £5. Since the Institution was granted a Royal Charter, the value of membership has risen, and the unauthorised use of its symbols by non-members is distinctly injurious to its status—for, obviously, the class of man who would stoop to such a deception would not be likely to confer distinction on the Institution.

By a curious coincidence another very similar action has also lately occupied the Courts, and was reported in our last issue (p. 1078). In this case an injunction was made against an electrical contracting company which unwarrantably led people to believe that it was on the National Register of Electrical Installation Contractors. If the value of registration to the installation industry is to be maintained, the use of it as a qualification must be zealously guarded by the Registration Board. Contractors who are prepared to conform to the requirements that have been laid down as the result of prolonged and expert knowledge and co-operation, are welcomed to membership. For the rejection of applications which occasionally occurs, the committee no doubt has ample justification, and the same remark applies in respect of the withdrawal of the right to use the Diploma which unfortunately sometimes becomes necessary. If these rejections or withdrawals had been regarded as unfair we should doubtless have received criticism of the Board's action, but so far no such complaints have come before us. There may be two opinions among contractors concerning the general subject of registration, but we can only hold one view of those who, while failing to conform to the requirements, try to gain prestige by falsely indicating to the public that they are officially recognised.

Foreign Travel for Foreign Trade.

THE necessity for engineers in positions of responsibility obtaining first-hand knowledge of other lands, their resources, and their opportunities, as a means of strengthening our business relations with them, was once more stressed in public speech at the annual dinner of the Institution of Mechanical Engineers. The place that engineering has so long occupied among our great national industries has made the whole world our field for operations and the sun never sets on the monuments to British engineering design, production and construction. This has long made it natural for our engineers to be foreign travellers, so that entrants in taking up the profession or craft of engineering have known quite as certainly as any body of students that in their future careers they would most probably at some time or other find duty calling them across the seas. When, therefore, the Duke of York in the speech mentioned urged the especial importance of mechanical engineers of the Empire seizing every opportunity to travel with a view to learning and imparting information of what was being done in their respective countries, he was bringing his distinguished influence to bear along a very natural and familiar, though none the less essential, line. In our own and other technical journals the point has been emphasised many times in the interests of our export trade, for engineering travellers are admirably trained for the purpose of grasping the possibilities for special knowledge to be directed to the utilisation of wasting or idle natural forces and resources in the interests of humanity. Apart from this

study of resources and the opportunities they present for engineers and engineering industry, there is another point which cannot be lost sight of, as the Duke of York also mentioned, namely, that nothing can take the place of personal meetings between individuals of different nationalities. We are sure that our electrical manufacturers and export traders will have this subject prominently placed in their programme of overseas trade effort in 1928.

London Transport Facilities.

As we have recorded in these pages, the Advisory Committee on London Transport, after prolonged investigation and experience, has emphatically insisted on the necessity of tramways to deal with the heavy passenger traffic of the metropolis, and has declared that in supporting their claim to a place in the transport service it is carrying out the express will of Parliament. Critics who abuse the tramway and demand its abolition show little regard for facts, whether technical or financial, but their vapourings are usually taken for what they are worth.

It is another matter, however, when no less an official than the chief of the Metropolitan Police Force—Sir William Horwood—breaks out into vituperation in an after-dinner speech and expresses his personal antipathy to tramcars. We are pleased to see that the *Tramway and Railway World*, in its current issue, points out the impropriety of violent prejudice on the part of a public official, and deduces from his remarks an explanation of the traditional opposition of the police towards improvements in the London tramway services, to which we have drawn attention in the past. The Chief Commissioner of Police should understand that his idiosyncrasies are not of public interest: let him confine his attention to facts, from which the proper authorities will draw their conclusions. In this instance the responsible authority is the Minister of Transport, acting on the advice of the Committee, which knows how to do its work without interference on the part of an official.

The Golden Age for Inventors.

It is asserted that there is no period more fruitful in new inventions than the time of great industrial and trade activity. In support of this view, the *Electrical World* devotes a large part of its issue of December 3rd to the numerous outstanding inventions and developments that have taken place recently in the United States. Our contemporary states that new discoveries are so numerous that they are now commonplace in the public mind and that the future holds promise of a continuation of this progress. But while commercial conditions are conducive to invention in the electrical industry, it is also to be observed that the multitude of inventions and developments each year has an important commercial bearing. "Invention breeds competition" and manufacturers, both individually and in groups, when unable to control markets, recognise the folly of dropping development or research work, as they know the inevitability of being left behind by competitors, losing markets, and unless they awaken in time, losing reputation and falling out of the race. The progressive state of the electrical industry in this country as well as in America is not only in connection with machinery, equipment, and cables; it is also becoming remarkable in the field of domestic and everyday electrical appliances and in the radio field, where by constant study of the requirements of the private user something new and improved is being continually made available. Some of the readers of these notes have endeavoured to carry their new ideas into practical effect, but have lacked the financial support necessary to enable them to do so. Even at this moment, maybe, they are at a loss to know which way to turn to give their discoveries concrete form. Our own correspondence from them tells of their dilemma. They would be encouraged if they could find an easy road to the right financier or to the sympathetic and accommodating manufacturer. According to the *Electrical World*, there are so many tasks awaiting the electrical machine or method that competing manufacturers and financiers are ready all the time to give a welcome to inventors of such, because they appreciate how real are the commercial advantages accruing through the introduction of a new or better machine. It gives a live reputation to any business if it is constantly introducing improvements, and is not afraid of the risk of superseding its own products. Mark these encouraging words:—"History has proved that money put into a needed invention is profitable business. Business-men's minds are favourably inclined towards electrical products, and financiers have enormous funds which are hunting profitable investments. This is truly the golden age for the inventor!" It has sometimes happened that inventors have brought ridicule upon their own unpractical heads, but let none be afraid to bring forward his ideas for new electrical contrivances that may serve the interests of a humanity which is destined to make ever-increasing use of electricity, because the path to the introduction department seems obstructed or the doorway closed. There is no lack of electrical minds fully able to appreciate the value of an invention, or of hands willing to lend experience and financial co-operation if the idea be one of merit.

The Electricity Commissioners' Report.

Elsewhere in this issue we commence an abstract of the Report of the Electricity Commissioners, to which we referred in these columns last week, dealing with their review of the past seven years. The past year, ended March 31st, unfortunately was clouded by the great industrial disturbances of 1926, with the result that the output of electricity increased by only 3 per cent.—a poor showing compared with the aggregate increase of 61.9 per cent. since 1921, an average annual growth of over 10 per cent., in spite of the actual drop of 5.5 per cent. in 1922; from the minimum reached in that year the total increase exceeds 70 per cent., whilst the consumption of coal and coke has risen by less than 35 per cent. New generating plant was sanctioned in 1926-27 aggregating 775,604 kW, a substantial gain on the preceding year, and nearly two-thirds of the new plant was to be installed by local authorities.

During the year the total amount of loans sanctioned was no less than £15,381,434, an increase of 60 per cent. on the previous year, and the largest amount on record. In this connection an important change is in prospect with regard to the period of repayment allowed in respect of generating plant; the maximum period in cases where there was reason to anticipate that the plant might be superseded by bulk supply was previously 15 years, but as a result of the passing of the Act of 1926, the Commissioners concluded that in such cases the period must be shortened, ten years being suggested as a more suitable maximum.

A very large increase took place in the number of applications for consent to the erection of overhead lines; 328 were dealt with during the year, nearly 70 per cent. more than in the preceding year, almost all of which were granted. Naturally, a corresponding increase was recorded in the number of applications for wayleaves, which numbered 49—more than in the whole of the six years preceding. The subject of "Regulations for Overhead Lines" is reviewed at some length in the introductory pages of the Report, and we note with interest and satisfaction the statement of the Commissioners that "for economic reasons alone, a much more extensive use of overhead lines than in the past, and the best possible facilities for their erection, will become necessary . . . for the adequate development of supplies in rural and sparsely-populated areas." "The Commissioners are fully seized of the importance of ensuring that the efforts of the industry are in no way handicapped by unnecessary restrictions or avoidable difficulties." Further, the Commissioners propose to reopen with the Postmaster-General the questions of protection of lines, and "second comer," "with the view of securing relaxation in his requirements."

Electricity on Board Ship.

Some features of the electrical equipment of the recently built 20,000-ton motor vessel *Bermuda*, which is intended to convey America's wealthy citizens between New York and the Islands of Bermuda.

THE electrical equipment of the M.V. *Bermuda*, fig. 1, the recently built 20,000-ton luxury vessel of the New York and West Indies Steamship Co., Ltd., is claimed to be the most comprehensive of any ship afloat. It possesses many features of unusual interest in that the design and construction of much of the apparatus have had to be carried out with a view to meeting special requirements, some of them of an artistic nature, others relating to the performance of special duties.

Practically the whole of the electrical plant and appliances were manufactured and supplied by the General

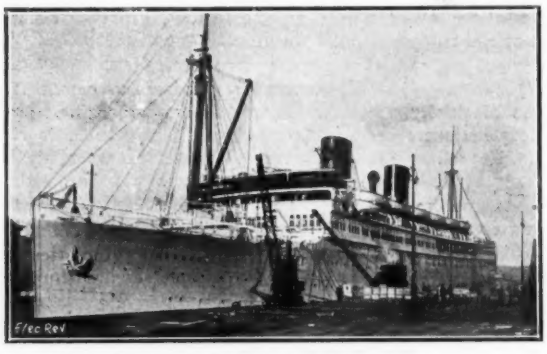


Fig. 1.—M.V. "Bermuda" in Dry Dock.

Electric Co., Ltd., and the contract provided for, *inter alia*, four 300-kW, 220-V d.c. generators, a 23-panel main switchboard, 54 ft. long, 150 motors with a total capacity of 2,500 h.p., 3,500 lighting fittings, 6,800 lamps, 500 fans, 300 cabin heaters, 100 telephones, 6,000 switches and control units, 10 electric lifts, and 36 electric cleaners.

The main generators, fig. 2, are driven by "Fiat" oil engines, and are situated in an auxiliary engine room adjacent to the main engine room; in this room is also installed the main switchboard, fig. 3. The feeder circuits are divided into two sections, preference and non-preference. By means of special relays it is arranged that, should a fault which is not cleared by its own protective device throw an overload above a predetermined value on the generators, the non-preference circuits would be first tripped out. Should the fault be on a non-preference circuit it would thus be cleared, but if it occurred on a preference circuit, after a predetermined time interval from the tripping of the non-preference circuits, the generator circuits themselves would be tripped. In that event an elaborate skeleton system of lighting would be instantaneously thrown on to a "panic" battery, which also supplies the bell system and other signalling apparatus. These essential services would be maintained until the fault could be cleared, or, alternatively, until the emergency generators could be put into operation.

The emergency generators are two 36-kW, 220-V machines driven by Weir-Sulzer Diesel engines, and, with the emergency switchboard, are situated on a deck well above the water line.

The electrically-driven machinery and appliances in the engine room include such apparatus as bilge, sanitary, fresh-water, auxiliary-fuel, and forced-lubrication pumps, air compressors and cranes.

On the decks such equipment as windlasses, winches, capstans, steering gear, and so on, is electrically driven. The motors for the heavier duties are made with cast-steel shells, and those for deck purposes are of a totally-enclosed water-tight pattern.

The motors driving such deck machinery as windlasses, capstans and winches are operated by means of automatic contactor panels in conjunction with master controllers situated either on or near the motors. Many ingenious devices have been embodied in these panels in order to provide wide ranges of control; in the case of the eight equipments for the control of the cargo winches, in addition to the usual gear for starting and stopping, provision is made for the speed of the motor to be increased on light loads; also for the rapid reversal of the motor, ensuring operation at maximum speed. The master controllers on deck are all of the water-tight pattern, and those below are of the drip-proof type.

In fig. 4 are seen two 105-h.p. motors coupled to Reavell air compressors. Fig. 5 shows a group of three 36-h.p. vertical motors employed for driving Drysdale fresh-water pumps.

One of the most prominent features of the electrical equipment of the vessel is the great variety of lighting fittings, ranging from the luxuriously ornamental fittings in the public rooms and cabins to those required for such utilitarian purposes as engine-room and cargo-space lighting. The illumination of

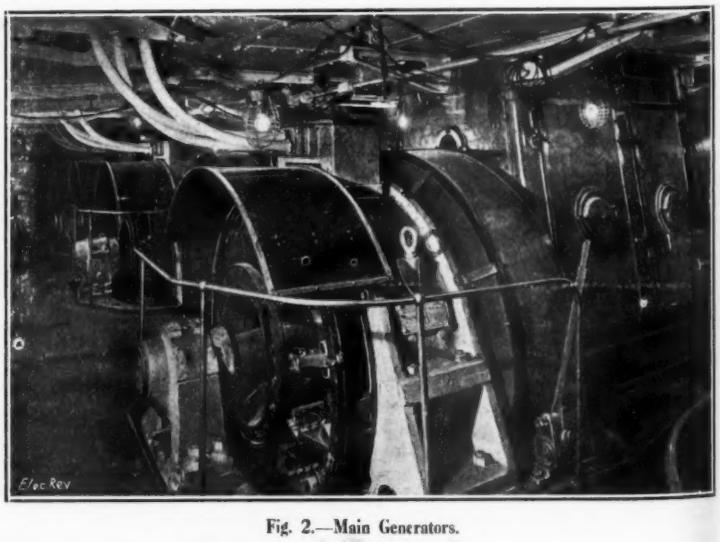


Fig. 2.—Main Generators.

the public rooms was carried out on a definite basis as to the foot-candle requirements, and the results obtained completely justify the methods employed. The fittings have all been designed in the closest co-operation with Mr. A. McInnes Gardner, decorative consultant, and the furnishing contractors, and each fitting is in complete harmony with the style of decoration adopted in any given department.

The lighting fittings in the dining saloon are of

handsome and dignified appearance, and the general illumination is catered for by some 50 octagonal gilt fittings attached to the panelled ceiling, and a number of semi-indirect wall brackets. For the purpose of local lighting there is a series of torcheres in niches in

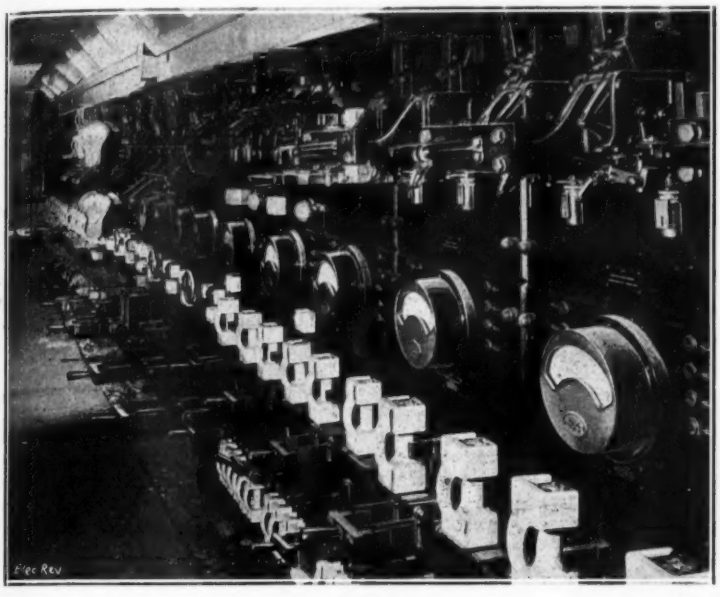


Fig. 3.—Main Switchboard.

the columns which support the gallery, while the domes are illuminated by indirect light from the cornice. The whole scheme of illumination is most efficient, producing an even distribution of light of most pleasing quality. Another interesting feature of the dining-saloon lighting is the use made of electric table mats which provide that no unsightly flexible wires run over the tablecloths to take current to the handsome table standards in the middle of the tables; neither is it necessary to have holes in the table linen on the tables. The lounge, through two domes and a centre lay-light, is flooded with light from "Gecoray" reflectors; in conjunction with four large ceiling fittings. This method provides ample general illumination of a softened character. Under the gallery are a number of

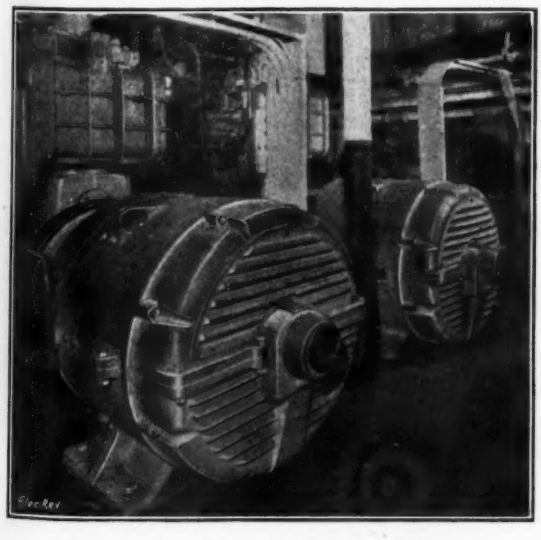


Fig. 4.—105-h.p. Motors driving Reavell Compressors.

small ceiling fittings and wall brackets which add to the decorative effect; above the gallery on the ceiling are small fittings for local lighting. The whole scheme is carried out in old silver with cut and satin-finished glassware. In the library, fig. 7, the centre fittings for the general illumination are finished in gilt. The problem of lighting the foyer was rather difficult to solve, owing to somewhat restricted headroom, but a special shallow ceiling fitting was designed which, with a number of torcheres, makes a very effective and neat scheme of illumination. The decoration of the smoking room is of a heavy timbered character; hanging ceiling lanterns therefore constitute a very suitable type of fitting. The illumination from these lanterns is supplemented from wall fittings, the metalwork of which is of armoured-steel finish and the glazing of a muffled light amber; a very restful form of illumination is the result.

The cabins and state rooms are illuminated by means of moulded glassware semi-indirect lighting fittings for the general lighting; further fittings are provided over the mirrors, and consist of metal brackets with moulded glass shades to match the general-illumination fittings. In addition, over each bed a reading lamp is provided of a design which harmonises with the general scheme. To regulate the illumination given by the reading lamp, a dimming switch is provided, by means of which the berthlight can be dimmed from "full-on" to "off" by gradual stages. There is also a lamp within the wardrobe which is automatically switched on and off as the door is opened and shut.

The ventilation of the public rooms is largely by

Fig. 5.—36-h.p. Vertical Motors driving Drysdale Fresh-Water Pumps.

means of the directional louvre system, the air being supplied by motor-driven fans, fig. 6, situated on the weather decks, thus ensuring that the air is ozone laden. The fan controls are just outside the public rooms. Supplementary ventilation is provided by a number of 2-blade "Magnet" ceiling fans.

For the ventilation of the state rooms and cabins, in addition to that provided by the directional louvres, 12-in. oscillating fans of the "Gyro" type have been installed. These are mounted on special ship-type brackets, and are arranged so that they can be controlled by the passengers when in bed. A special feature of these fans is that by means of the "Gyro" movement the air in the cabin is kept in a perpetual state of motion. A very simple and effective 2-speed control is provided by means of a 2-way switch only, thus eliminating the need for a regulating resistance. To provide for the comfort of passengers in cold weather, non-luminous ship-type radiators are installed in the state rooms; the metal work of these is finished to har-

monise with the other metal work in the apartment. The temperature of the cabin can also be regulated by means of the directional fans, the air being heated by steam heaters *en route* to the cabin. A further feature of the electrical installation in the state rooms is the provision of switches, with the aid of which passengers are enabled to control the various electrical appli-

Fig. 6.—10-h.p. Motor driving Directional Fan.

ances with the least possible trouble. These are situated at the head of each bed on a multiple switchplate, which also contains two bell pushes for communicating with the stewards. The second-class cabins are illuminated by means of semi-indirect bowl fittings mounted on the ceiling, the metalwork being real bronze. A small berth-light bracket with a silk shade, which is controlled by a dimming switch, is over each berth, while provision is also made for a 12-in. "Gyro" fan. Flush switch plates are situated at the head of the berth and at the doors of the cabins.

The wiring in both the first and second-class cabins is concealed, all the switches, bell pushes and plugs being mounted flush behind plates which harmonise with the other metal-work in the cabin. Officers' and engineers' cabins are fitted with lighting pendants and portable lamps, while fans are provided to assist the ventilation. In the passages and alleyways there is, in addition to the general illumination, a large number of directional lighting signs, and over every fire-alarm push there is a small bracket with a red sprayed lamp.

The illumination of the decks and working spaces is provided for by means of stirrup well-glass fittings and heavy cast bulkhead fittings, and the engine room is lighted by means of lanterns equipped with white gasfilled lamps. Portable cargo lanterns are provided; an interlocking device is used with these, which makes it impossible to make or break the cargo connection with the controlling switch in the "on" position.

To comply with the Board of Trade regulations relating to the launching of lifeboats at night, a new type of lantern has been designed which is capable of illuminating the sides of the ship and the sea, so greatly facilitating the embarkation of passengers in lifeboats and the launching of the boats. For communication between the passengers and stewards a luminous indicator system is utilised. Calls from a passenger are shown visually on an alleyway indicator which is fitted with small lamps placed behind a lettered or numbered screen. All the corridor indicators on each deck are connected to a master indicator situated in the deck pantry; this has one lamp corresponding with each alleyway indicator. A further master indicator is placed in the bureau, having one lamp to correspond with each deck pantry, and a similar master indicator is placed in the second steward's office. One great advantage of the system is that though the bell is intermittent and only rings when the push is operated, the lamp remains illuminated the whole time until the call is cancelled by the steward or stewardess or by the passenger at the push itself, by the simple expedient of turning a ring provided for the purpose. Thus every call must receive attention with the minimum of delay. In certain parts of the ship, in addition to the luminous bell indicator system, a number of special ship-type locking mechanical replacement indicators are installed.

A large number of ship-type telephones are employed in various parts of the boat. They are controlled by a 70-line deck-pattern central lamp signalling telephone switchboard. This switchboard is so arranged that it can be connected to shore exchanges when the ship is in port, rendering it possible to speak from any of the telephone instruments connected to the switchboard to any subscriber on shore. A system of fire communication is provided. A number of glass-fronted locking pushes are conveniently disposed about the ship. A luminous indicator situated on the bridge, so as to be under the observation of the officer on watch, is used in conjunction with the pushes to show the origin of the alarm. An alarm bell controlled by a continuous-action relay is placed adjacent to the indicator to draw attention to the call. Incorporated in each of the pushes is a socket for a telephone jack, and a similar socket is incorporated in the luminous indicator. Two telephone hand combinations are suspended in the luminous indicator. Also adjacent to the luminous indicator is

Fig. 7.—The Library and Writing Room.

a switch for controlling the alarm bells placed in the crew's quarters.

When an alarm is given by breaking the glass at a call point and depressing the push button, the corresponding lamp in the luminous indicator is lighted, and the bell at the indicator is rung. The action of inserting the plug automatically restores the push and introduces the telephone into the line. The lamp at the indicator will

be somewhat dimmed, and on noticing this the officer on duty may insert his own telephone in the jack socket provided and communicate with the man at the call point.

A navigation-light indicator is situated on the bridge to show the officer of the watch whether the navigation lights are burning satisfactorily. In the event of a navigation light failing, a corresponding lamp in the indicator goes out and the bell is rung.

An interesting piece of apparatus in the chart-room bridge is a submarine signalling direction finder. This instrument is worked in conjunction with two microphones situated one on each side of the bow of the ship, and will pick up signals transmitted by submarine bells.

The wireless broadcast-telephone equipment of the vessel enables a wide range of entertainment to be provided in public rooms and state rooms; independent and local controls are provided for each point. The "Orchestrola" equipment consists of a 9-valve amplifier, fed by a 400-V battery.

A large number of attachments are provided at various parts of the ship for the use of electric vacuum cleaners.

Three electric passenger elevators, one goods elevator, one engineer's elevator, and five service elevators, together with a special electric runway capable of taking in stores from either port or starboard side, also form part of the electrical equipment. The elevators will work in safety, it is claimed, under all conditions of pitching and rolling. The low-voltage signalling system for calling the elevators and showing their positions forms a useful refinement.

The Marconi radio-telegraph equipment reveals a departure from the standard ship's installation. The spark transmitter, whilst fully complying with all Government regulations, is of comparatively low power, and for long-distance communication there will be a new type of valve transmitter. The quenched-spark 0.25-kW transmitter will also incorporate the emergency set, operated either from the ship's electricity mains or from an emergency battery of accumulators. The valve transmitter is of an entirely new design for ships' apparatus, and uses a power of 1½ kW; transmission will be on wave-lengths of 600 to 850 metres and 2,000 to 2,750 metres. In addition to continuous-wave transmission, interrupted-continuous-wave (which can be detected by any type of receiver) is used for signalling on the shorter wave-lengths; c.w. is allowed for on the longer wave-lengths. The advantage of the valve transmitter is the long distance which can be covered with a moderate input and the sharp tuning which reduces interference with other services to a minimum. The receiver also includes a recent development in the form of a note filter, which can be adjusted to respond only to the note of the received signal, and remain comparatively insensitive to all other frequencies. A Marconi direction-finder has also been installed, and two lifeboats will carry sets operated by nickel-iron batteries.

In conclusion, it is interesting to note that about 140 miles of cable was used on the installation, and that the work, which was carried out by the Sunderland Forge and Engineering Co., Ltd., was completed in 4½ months.

The Phase-Swing of Alternators.

A Laboratory Method of Observing the Phenomenon with the Aid of a Rotating Switch.

By J. C. PRESCOTT, M.Eng., A.M.I.E.E., and D. H. WILLS, B.Eng., Ph.D.

THE apparatus described below was designed with the object of enabling laboratory measurements and observations to be made on the phenomenon of the phase-swinging of alternators, and consists essentially of a rotating switch. Oscillograph records of the disturbing force and of the synchronising current are reproduced, from which the phase relation above and below resonance can be observed.

General.

An alternator or synchronous motor will hunt when subject to a disturbing force whose periodicity is equal, or nearly equal, to the natural free period of the alternator itself, and the effect of this hunting will be, *inter alia*, to circulate a synchronising current, which current will be greatest when the successive periodic displacements of the machine reach their maximum value, that is to say, at the condition of resonance, and will diminish as the periodicity of the torque variations is increased or diminished from the resonant periodicity.

In the case under consideration a synchronous motor was used to drive a d.c. generator, the load upon which was varied periodically by the insertion of resistance in the d.c. armature circuit.

The equation of motion may be written:—

$$T_a - MK^2 \cdot d^2\theta/dt^2 + a \cdot d\theta/dt + c\theta = T_d - b \cdot d\theta/dt + T_d'$$

where T_a = Synchronous motor torque (constant).
MK^2 = Moment of inertia of rotating parts.
a = Synchronous motor damping factor.
c = Synchronous motor restoring force.
T_d = D.c. generator torque (constant).
T_d' = D.c. generator torque (varying).
b = D.c. generator damping factor.

Assuming unity efficiency, $T_a = T_d$

and $T_d' = MK^2 \cdot d^2\theta/dt^2 + (a + b)\, d\theta/dt + c\theta$.

If $T_d' = T_{max.} \sin \omega t$, and $(a + b) = B$,

then $\theta = T_{max.} \cos(\omega t - \phi)/\sqrt{[(c - MK^2\omega^2)^2 + \omega^2 B^2]}$.

When resonance occurs, $c = MK^2\omega^2$, and θ has its maximum value

$$\theta^1 = T_{max.} \cos(\omega t - \phi)/\omega B.$$

The natural free period of the machine is, neglecting damping, $t_0 = 0.261\, N\sqrt{(MK^2/m\, E\, I\, f)}$,

where MK^2 is the moment of inertia of the moving parts in kilogram-metres, m the number of phases, E the voltage per phase, I_s the short-circuit current per phase, f the frequency of supply, and N the revolutions per minute.

The phase relation of the damping, accelerating and restoring torques may be exhibited by means of vector diagrams:—

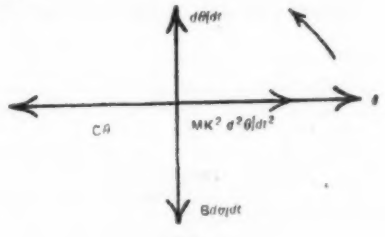


Fig. 1.

The restoring force acting in the opposite direction to the deflection accelerates the moving parts, and therefore acts in opposition to the force exerted by the

moving parts when undergoing acceleration, thus $c\theta$ and $MK^2d^2\theta/dt^2$ are in antiphase. Assuming the motion to be simple harmonic, θ will be zero when $d\theta/dt$ is positive and decreasing, if θ is a positive maximum when $d\theta/dt$ is zero and about to become negative. Thus $d\theta/dt$ will lead θ by $\pi/2$, and since the damping force acts in opposition to $d\theta/dt$, $Bd\theta/dt$ will be in antiphase to $d\theta/dt$. The resultant of $MK^2d^2\theta/dt^2$, $Bd\theta/dt$ and $c\theta$ must be balanced at every instant by the force, externally applied, which is carrying the harmonic vibration. The diagram therefore becomes--

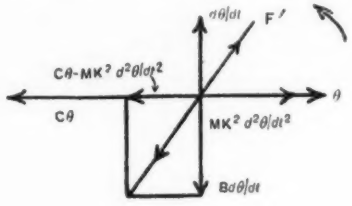


Fig. 2.

If $c\theta > MK^2d^2\theta/dt^2$ F^1 leads by less than $\pi/2$ upon θ.
If $c\theta < MK^2d^2\theta/dt^2$ F^1 leads upon θ by more than $\pi/2$.
If $c\theta = MK^2d^2\theta/dt^2$ F^1 and θ are in quadrature.

Apparatus.

The rotating switch used in the experiments permits a variation of external resistance which gives a square curve when plotted against time, see fig. 3.

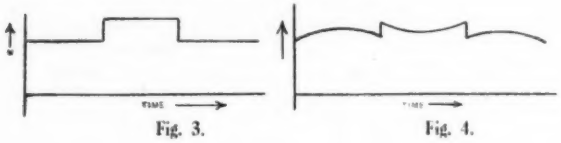


Fig. 3.

Fig. 4.

When the resistance R is increased the load on the d.c. generator side is reduced, since the current falls, and the machine is accelerated from the a.c. side. This acceleration causes an increase in back e.m.f., and the current therefore rises till, as the machine passes the mid-point of its swing, the current is a maximum (for this condition of external resistance), after which the current falls to the value it exhibited just at the point of increase in resistance. A decrease in resistance causes a retardation of the armature which modifies the current after the beginning of the retardation period, since the back e.m.f. of the d.c. machine falls. This is shown diagrammatically in fig. 4, and in fig. 9 a copy of an oscillogram is reproduced showing an actual record.

Rotating Switch.

An ebonite barrel $2\frac{7}{8}$ in. in diameter, enclosed by two half-cylinders of brass, constitutes the revolving part. The half-cylinders are separated on either end of a diameter by a space of $\frac{1}{8}$ inch, and one of the half-cylinders is divided circumferentially at its mid-point. A pair of carbon brushes, of a width less than the length of the half-cylinder, press on the brass and are thus in metallic contact when the continuous half-cylinder is under them, and are open-circuited when pressing on the two halves of the divided half-cylinder. The barrel

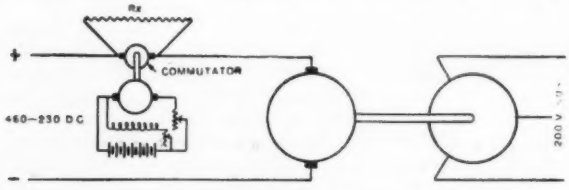


Fig. 5.

was driven through 8:1 reduction spur gearing by a 1-h.p. shunt motor, which was provided with adjustable resistances in both field and armature circuits, fig. 5.

One of the carbon brushes was arranged to be adjustable circumferentially with respect to the other, the maximum period of short circuit occurring when the brushes were in line.

The commutator was connected in series with the armature of the d.c. machine and shunted by a resistance which could be varied, and which was capable of carrying continuously the load current of the machine.

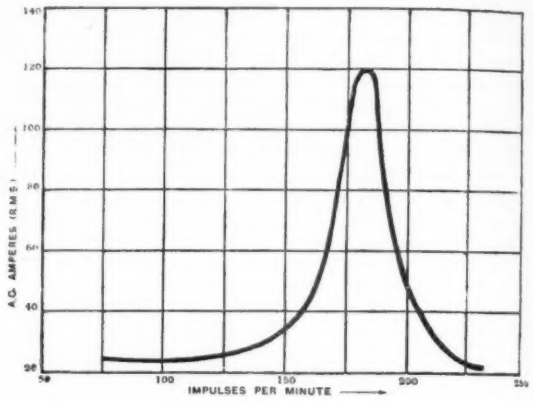


Fig. 6.

The machine upon which the experiments were carried out was a motor-generator set by the Lancashire Dynamo & Motor Co., consisting of a 460-volt direct-current motor rigidly connected to a 200-volt 10-kVA 50-cycle alternator having eight poles.

Experimental Results.

The experimental results obtained with the commutator are shown by the accompanying graphs and oscillograms. Fig. 6 is the resonance curve for the 460-volt

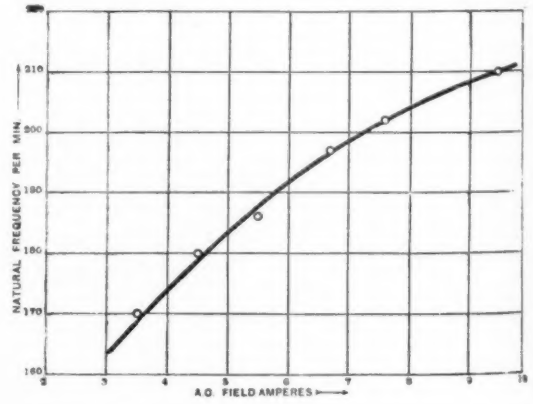


Fig. 7.

10-kVA motor-generator working on 230 volts d.c. with a weak field to emphasise the swing. The a.c. field was maintained constant, and the a.c. armature current is plotted against the imposed impulse frequency. The rapid increase of current at the resonance frequency facilitates the estimation of the free period of the machine. As a check on the value thus obtained, the moment of inertia of the moving parts was measured by the Kapp retardation method, and a short-circuit current of the a.c. machine obtained for the given a.c. excitation. The value of the free period calculated from these figures is 0.39 second against 0.32 second obtained from the curve. The discrepancy may be accounted for by the fact that the machine has salient poles, and the value of the synchronising power when swinging may therefore not be directly proportional to the short-circuit current.

Fig. 7 shows the variation of free period with the a.c. field excitation, and is obtained by plotting the crest values of a series of curves such as fig. 6 against

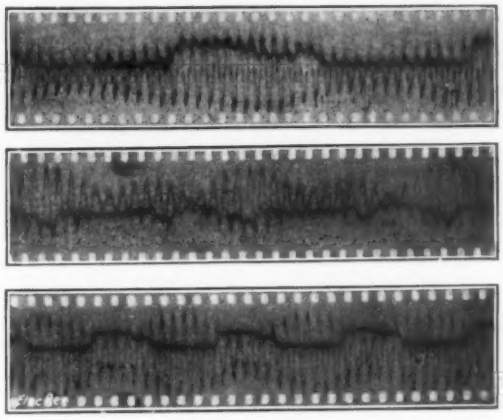
a.c. field currents at which these crest values were obtained.

Figs. 8, 9 and 10 are reproductions of oscillograms: fig. 8 at a frequency below that of resonance; fig. 9 at a resonance frequency (alternating current scale reduced 2.5 times); and fig. 10 at a frequency above that of resonance.

The change of phase between the displacement as indicated by the maximum value of the alternating current and the disturbing force as indicated by the modified square curve can be noted.

Conclusion.

In conclusion, the authors wish to express their gratitude to Professor E. W. Marchant, at whose suggestion the investigation was undertaken, and who placed at their disposal, for the experimental work, the Laboratories of Applied Electricity of the University of Liverpool.



Figs. 8, 9, 10.—Reproductions of Oscillograms.

Export Office Organisation.

The author elaborates plans for the setting-up of an Export Trade Department. Office organisation, literature, market operations, representatives and their qualifications, and various other points come under discussion.

By GILBERT C. RICH.

(*Concluded from page* 1075.)

WITH regard to the question of agencies, in my opinion it is not always advisable to choose an agent who already represents a number of well-known articles, because in practice it does not always happen that such a firm obtain the best possible results for you. A firm of this type, having established themselves, possess, no doubt, the best connection if they are dealing with the right class of buyers, but the question that arises is one of great importance from your point of view. Are the principals who developed the business in the past still actively participating in the getting of business and the introduction of new lines? It was no doubt the personality and industry of a man or men in the business which secured the past success, and if those factors have now been wholly or partially withdrawn and reliance is placed upon travellers, it is very doubtful if your goods will meet with the success you anticipate when employing a firm of old-established agents. On the other side of the picture there is the young business man, working on his own account, whose future is dependent on his activity, pushfulness and hard work. With most products for which a technical knowledge is not required it will be well to select a man who has his way to make in the world, provided that you are satisfied that he "fills the bill" in other ways. Do not overlook the fact that it is not necessary for a commission agent to be possessed of large means; he does not lock up capital in stock.

Other matters of organisation largely depend on your policy and the nature of the products you are handling, but the appointment of agents, establishing of branches and sending abroad of representatives should receive full consideration when you are deciding on your policy.

If the product will allow of the expense of personal visits to markets, this is to be strongly advised, and the first visit, if possible, should be made before an agent is appointed, as you can judge as to the possibilities of an agent meeting with success so much more satisfactorily when you see him at work in his particular locality than you can ever hope to do by correspondence. Subsequent visits will help to encourage your agent in his efforts, and they are also greatly appreciated by overseas firms, whose interest in your goods is stimulated if a representative of the home manufacturer comes out to visit them in a friendly and interesting way.

At the present day travelling expenses will, of course, debar some small manufacturers from allowing their export managers or any other representatives to visit distant countries, but there are one or two fairly good alternatives:—

(1) Some of the larger manufacturers, in sending out representatives to several distant countries, are agreeable to his carrying the samples of, and representing on a commission basis, two or three other manufacturers. In such cases, the commission is usually divided between the employers and the representative, so that the latter has an inducement to use his best endeavours on behalf not only of his own, but also the other firms. It is customary for those manufacturers who take advantage of such an offer to contribute something to the expense of the journey.

(2) Another method is to arrange with a firm of manufacturers' agents in this country who send out a representative annually to certain markets. These firms, who are neither merchants nor confirming houses, merely act as your representatives in their particular countries, calling on your customers and other firms likely to be interested in your products, and advising you as to local conditions, a knowledge of which is so essential to real success. Unfortunately, there are only a few of such firms in existence.

(3) A third method is for several manufacturers to unite to form an export sales company, as such a combination enables each member of it to receive the great benefit of personal overseas visits at a reasonable cost, especially if the object of the sales company is not profit-making, and all profits realised are utilised in increasing its members' sales.

When the question of policy is under consideration, special emphasis should be laid upon this suggestion.

It will always pay to select a market—the potentially best market—and for a while devote energy and attention to that country until you have made a real success of it. Afterwards it will be a comparatively easy matter to carry on there, and to proceed to concentrate upon another market. The process may be repeated until each country has received individual attention.

The question which is your best potential market is not easily answered, but if you have collected data in the manner already suggested, you should be in a posi-

tion to consider the matter from all points of the compass, and arrive at a reliable conclusion, after which you can organise in conjunction with your agent an up-to-date sales campaign in the territory selected. It is usually unwise to endeavour to bring about the intensive working of the whole country at once; the most promising town or district should at first receive the major portion of your attention, and you can subsequently extend your activities gradually until the whole country is being thoroughly well worked. While dealing with this subject, I would say that it must not for a moment be supposed that because an advertising scheme was successful in the home market, it will necessarily be so in an overseas country; this most certainly does not follow as a matter of course. The varied temperaments and idiosyncrasies of foreigners differ so greatly from our own that an idea which has been quite successful in the United Kingdom may prove an utter failure abroad. It is, therefore, clear that you must study a market from the advertising point of view, and satisfy yourself, so far as possible, that a particular scheme will appeal to the general public in the country you propose to work. Your agent can be of great assistance to you in this connection if you avail yourselves fully of his services, and a personal study of the conditions existing in the market by means of a visit will also be of very great value.

When once the market is going satisfactorily and yielding a reasonable turnover, your agent should be able not only to maintain sales at the level already reached, but also to show regular increases each year with a minimum of advertising, which may be defined as the amount of advertising which is necessary to keep your name before the notice of the public; if sales in a particular district show a tendency to fall off, a special effort may be made there. Statistics are, of course, very necessary in connection with such matters.

There are two other very important matters connected with an export office or department, with which I have yet to deal. First, freight has to be considered. This is an item which will affect your own company in connection with c.i.f. quotations, and your customer where your quotations are for f.o.b. delivery only. I have met exporters who, unfortunately, are of opinion that if the overseas customer defrays the cost of freight, what it amounts to is of no consequence, and such an idea is, of course, an utter fallacy. It is just as necessary for you to keep down the freight charges whether they are for your own account or for your customers, as the less your goods cost when landed in the other country, wherever it may be, the lower will be the selling-price there, and the greater your chances in competition with other producers exporting to that market. It is useless to say that because your products are "quality" goods the price does not matter; this is not so in these days, as even in a "quality" market, although the user is prepared to pay more for the superior article, there is a margin in the difference which can be stretched too far, with the result that the buyer is driven to use inferior articles rather than pay extortionate prices.

It therefore behoves the exporter to keep his freight record up-to-date, and to feel certain that he is shipping at the lowest possible cost each time he dispatches a consignment. Another point which requires watching in this connection is packing. You should be certain that your case-making and packing departments fully understand export packing, especially if freight on your goods is calculated on a measurement basis, as all wasted space in export cases has in those circumstances to be paid for.

Insurance also requires much attention. If the business is considerable, it may be profitable to run a special insurance department and become a member of Lloyd's, but there are always good agents who can effect your covers at reasonable rates. My experience with the latter, however, has taught me that it is necessary to watch them constantly, as it never occurs to them to come to you and say that they can obtain you a lower rate for such-and-such a market, nor do they try to do so; but if occasionally you give them to understand that there is a possibility of their losing your business unless a reduction in rates is obtained, the desired reduction is forthcoming, especially if your covers are known to be good ones. I recently obtained a quotation which was 30s. per cent. lower than previously from an agent simply because he was able to inform the underwriters that we had been shipping to the market in question for many years without having a claim of any sort, and my overseas client was very surprised at the lower rate obtained. It is, therefore, clear that reliable and up-to-date records, not only of freight rates, but also of insurance premiums, should be kept.

This article has so far been written from a general point of view, and not from that of any particular trade, but reference should be made to some points of especial interest to the electrical trade.

So far as electric light fittings, lamps, and sundries are concerned, I think that my general remarks will cover these, but with regard to the sale of electrical machinery, an ordinary manufacturer's agent would not, I venture to state, prove of much use in an overseas market. It is absolutely necessary that the representative should be a technical man who thoroughly understands the machine plant that he is endeavouring to sell. For instance, we will suppose that a large manufacturing company in an overseas market is wanting an electrical plant for its factory, and it is approached by the representative of a German firm who is a highly trained engineer and can make the most of the goods he has to offer, whereas an English firm's representative, who is also desirous of booking the order, is not a technical man; the German will stand a very good chance of obtaining the order.

On the other hand, if the English representative is a technical man, he will no doubt be able to prove that the British goods are not only of better quality, but also that they are more suitable for the work they are required to do, and if the difference in price be not too great, he should succeed in booking the order.

There are, of course, many other considerations that are important—for example, how essential a qualification is that thing that we call personality—ability to make points well, and at the same time the possession of that persuasive quality which is so necessary to all salesmen. Someone may say: "But in the case of small motors and other similar articles any ordinary salesman can sell these without technical knowledge," and to a certain extent he may do so. It may chance, however, that in these days of keen competition, technical knowledge may be necessary to show why your goods are more suitable than others on the market and why one make is better than the make inquired for to do the particular work required of it.

Another matter to be considered is the Colonial or foreign Government's tender. Here it is very necessary to have a man on the spot who has a thorough technical knowledge not only of electricity and engineering, but also of a firm's own special plant or goods; in some instances now the overseas Government insists on the actual offer being made to them through the medium of a firm or representative resident permanently in the country. This is, of course, to ensure that someone in the country receives some benefit from the placing of the order and also even with a thought of the income tax eventually to accrue through the increased earnings of the resident traders. They may fail to realise that, in some cases, they have to pay extra for the goods required, as the supplying manufacturer has to take into consideration, when making out his tender, the extra commission and expenses necessitated by working through someone resident in the country of destination, whereas if he could tender direct to the overseas Government without an intermediary, no doubt he could reduce his price. It is very doubtful, therefore, whether the overseas Government does receive any benefit from the method adopted; although the local trader does so, his benefit is indirectly paid for by the Government.

I would suggest the following *questionnaire* as one

likely to be useful in dealing with applications received from would-be overseas agents, *viz.*:—

(1) How long established?
(2) What British manufacturers do you represent?
(3) What foreign manufacturers do you represent?
(4) With what trades do you deal?
(5) What technical qualifications or degrees do you possess?
(6) Are you in touch with all potential buyers of electrical plant, machinery, and sundries?
(7) Have you the *entrée* into Government buying circles?
(8) What are the general terms of payment in your country?
(9) Is Germany or any other foreign country granting exceptional terms of payment. If so, please state what they are.
(10) What commission do you require?
(11) If you require any allowances over and above your commission, please give full particulars and your reasons for asking for such an allowance.
(12) Kindly furnish three trade references and one banker's—British houses preferred.
(13) What does your sales organisation consist of, and how often do you visit outlying towns and districts?
(14) Please state exactly what territory you cover, including all towns visited.
(15) Would you be prepared to undertake not to represent nor to be interested in, directly or indirectly, any other goods, plant, or machinery which in any way compete with our products?

The Revised Railway Rates.

Their Effects upon the Electrical Industry.

By J. W. PARKER, A.M.Inst.T.

THE virtual completion of the long-drawn-out inquiry into railway rates in preparation for the new system which becomes effective on January 1st, presents an opportunity for considering the general effect of the revised methods upon the electrical industry.

During recent months the various official publications required for the ascertainment of rates have been made available. The classification of goods now makes its appearance in three portions, part 1 being given over to inflammable, poisonous, and generally dangerous goods, part 2 to ordinary goods, and part 3 to merchandise conveyed by passenger train. The last-named is an innovation as up to the present the conveyance of articles by passenger service has been upon such a simple basis as to render classification unnecessary. Sections 1 and 2 cost 2s. 6d. each, whilst 3 is obtainable for 6d. They can be inspected at any railway station or purchased from the Railway Clearing House, Euston Square, N.W. Electrical interest is almost entirely confined to number 2, or the general portion of the classification, which is now freed from much miscellaneous matter contained in the old book. The entries have been re-arranged on more convenient lines, cross references being a distinct feature of the new order. Under the general heading of "machines and machinery" a variety of electrical goods will be found, including alternators, condensers, dynamos, field pieces and housings, generators, armatures and rotors, magnetos, transformers, all of which are in class 12 if forwarded in lots of five tons, No. 14 if in lots of two tons, and No. 16 for smaller quantities. The requirement, it will be observed, is not so many tons per truck, there being no minimum wagon load imposed. Certain pieces when not packed in cases or frames come in class 18, controllers, generator parts, magnetos and transformer coils being some of the goods so affected.

The most noteworthy feature of the new class or "standard" rates is that they do not appear in the station book at the actual usable figure but have to be calculated from the data given or else obtained by reference to the standard scale of charges. Whichever method is used, distance is the chief figure; mileage is of much greater importance all round than under the old method. Taking the first-mentioned method, charges will be ascertained in the following manner, using as example switchgear in class 18 travelling 100 miles:—

TERMINALS.	s.	d.
Station terminal, forwarding end ...	2	5
Loading	1	7
Covering		3
Ditto for destination end	4	3

CONVEYANCE.

	s.	d.
20 miles at 5.50d. per mile	9	2
30 miles at 4.25d. per mile	10	7½
50 miles at 3.50d. per mile	14	7
Per ton £2	2	10½

The simpler method is to purchase a copy of No. 1 schedule (which costs 1s.) as this table gives the chargeable amount on all the twenty-one classes at each mile between 6 and 800. In addition, the rate at quarter miles up to 20 is also given. Altogether there are fourteen scales of standard charges excluding No. 1 just mentioned, No. 4 concerns the electrical industry as it is responsible for the owners' risk rates.

Under the old arrangement various goods when consigned under an owners' risk note were entitled to a reduction of 10, 15 or 20 per cent. according as they were marked in the classification by the letters X. Y. or Z. The new order abolishes these concessions and substitutes a series of graded allowances distinguished by letters A to H, with percentages ranging from 2½ to 12½. As the revised allowances are not nearly so generous, it follows that the equivalent of increased rates will be incurred where goods which previously had 15 per cent. are reduced to 5. A variety of electrical trade goods are concerned; for instance, cable terminal boxes in class 16 have 3¾ per cent. under the "B" allowance, as have electrical regulating resistances, whilst distribution boards, fuseboards, and switchboards have the "C" allowance of 5 per cent. Some electrical instruments qualify for 6¼ per cent. under "D." The "A" reduction of 2½ per cent. is represented by generator parts, magnetos and transformer coils. In some instances no allowance of any description is made, although 10 per cent. was previously the rule. As a serious increase in rates in certain cases, is the consequence of this new arrangement, the railways were prevailed upon to consider the granting either of a lower classification or an exceptional rate where a substantial advance in charges resulted from the new method, and an appreciable amount of goods were being forwarded. Anyone using the present X. Y. Z. reductions should examine the new classification and promptly negotiate with the railways for a concession upon the lines indicated above. A further standard scale which should not be overlooked is No. 12 dealing with heavy articles. The existing method of charging articles exceeding 12 tons in weight is to make a percentage addition to the usual rate, but No. 12 table calculates the extra amount upon a mileage basis. For the first 10 miles, 4.75d. per mile is the sum added, and 3.25d. for the next 10. In respect of the following 30 the charge falls to 2d., the succeeding 50 are rated

at 1.25d. and for the remaining distance the charge is 0.75d. per mile. Both total charge and mileage are the subject of a minimum, the former being 10s. and the latter 6 miles.

Whilst the foregoing applies to standard rates, the charges of most use to the industry are exceptional rates. Unlike "standard" amounts, "exceptionals" are, or will be, shown in the station rate books at the actual chargeable figure, no calculation being necessary. Another difference is that although standard figures are fixed beyond dispute, a considerable amount of inquiry and negotiation continue to be necessary in dealing with "exceptionals." Broadly speaking, all those figures between 5 and 40 per cent. below the corresponding standard amounts are being continued provided they have been used during the period 1924-27. Even within these limits, some adjustment will be necessary, which if agreed, will enable the rates to continue, but if the trader disputes any particular figure he should request the secretary of the railway company concerned to refer the amount to the Railway Rates Tribunal for final decision. It may happen that a required figure has been overlooked by the railway; in this case it is, of course, necessary to draw attention to the omission.

All "standard" rates are to be upon a "station to station" basis instead of "collected and delivered" as most of them are to-day. On the other hand, those existing "exceptionals" which are noted as "C and D" will be continued under the new order without alteration but new figures to be granted in the future will be "station to station." It will thus happen that "C & D" and "S to S" exceptional rates will exist side by side.

The railways will, of course, still undertake the services of collection and delivery at those stations where they possess the facilities, such places being indicated in the rate book by a star. To enable door-to-door rates to be calculated all starred stations have been grouped according to the cost of cartage and these divisions are indicated by the letters "A" to "H." A column in the rate book is specially provided for the appropriate charge letter. Knowing the letters applicable to both sending and destination stations, reference to the cartage table at the front of the rate book renders the compilation of "collected and delivered" charges a comparatively easy procedure.

Returned empties have now been classified in eight divisions by again using the letters "A" to "H" to denote the separate sections. Class "E" is of greatest use, although "F" which caters for acid carboys is sometimes required. Those empties which collapse flat, and are consequently granted a more favourable rate, are included in class "H." The revised charges for the most part are distinctly lower for returned empties, under the new order.

The various "list" rates call for some notice as they are often the means of securing an exceptional rate upon goods which otherwise could not hope to obtain a favourable quotation. As they now appear, the lists have been revised, grouped together and identified by the letters "A" to "W." Hardware, for example, is now list "J"; iron and steel possess four lists, K, L, M and N. Electric cable junction boxes come in "L" as do nuts and bolts, washers and wire. Telegraph stores such as earth plates, ridge chairs, stay rods and screw tighteners come in "M." List "O" covers joiners' work and includes wood casing for electric wire. Machinery under "P" contains a wide variety of electrical goods including alternators, condensers, dynamos, field pieces, generators, motors, &c. Numerous other alterations will be found but to give them in detail is beyond the scope of a short article.

A Lesson from Mr. Ford.

A plea for a systematic reduction of prices for electrical apparatus and energy as the best method of hastening electrical development.

By CYRIL J. CRAWSHAW, B.Sc.

MR. J. W. THOMAS, in his excellent article "Lessons from America" (ELEC. REV., November 25th), has a passing reference to Mr. Ford, and states that Mr. Ford is the principal exponent of the gospel of high wages. Admittedly, Mr. Thomas could only just touch on Mr. Ford's principles, but it may be of interest to go a little deeper into these ideas and to see what Mr. Ford himself says about his business.

Mr. Ford is one of the greatest men the world has ever known, and this is due not only to his immense vision, business ability and tremendous zeal, but also in a great measure to his efforts to carry on his business with the strictest ideals of business morality and justice.

A modern Polonius gave some advice to his son in the following terms:—"If you take 2s. 6d. which doesn't belong to you, it is stealing, which is a crime, and therefore to be condemned. If you win 2s. 6d. by gambling, it is a folly and hence must be shunned. If, however, you buy an article for 2s. 6d. and sell it for 5s., it is good business, and is to be highly commended."

Mr. Ford has never bought an article for 2s. 6d. and sold it for 5s., but by selling at 2s. 9d. has shown in a remarkable degree what true service in business really is. Briefly, his theory is to sell at the lowest possible price, to pay the best possible wages, and to reduce prices consistently as the sales increase. He set out in his early days to prove this theory, and in spite of enormous difficulties and prejudices, he has never yet been beaten. Every year his sales increased, and every year he reduced the price of his car. He advertised very little, as the cars sold themselves. (Now, of course, the firm does advertise owing to the greater competition.) His ideas of service were forcibly demonstrated when he returned $70 to every purchaser of a car in one particular year as owing to an unforeseen increase in sales and a consequent reduction in the price of production, the actual selling price had been exceeded by that amount. This method of business was Mr. Ford's own, but so successful has it proved that it is widely copied throughout the States.

The analogy between the car industry (as exemplified by Mr. Ford) and the electrical industry is very close. They are both what might be termed "necessary luxuries," and although not essential to human needs, make for a great standard of comfort. In both cases there is a big potential market, particularly in the case of electrical domestic development.

Let us see how Mr. Ford's ideals of service compare with those of the electrical industry as applied to domestic electrification. As regards apparatus, it seems that the majority of appliances are far too expensive for the man in the street, that is, the man with a limited regular income, who represents the industry's greatest potential market. Compare the price of a vacuum cleaner with that of a motor bicycle. On its merits, the motor-cycle is incomparably better value for money than is a vacuum cleaner. As another example, consider lampshades. Any man with a certain amount

of practical ability could make a wooden frame and put a silk shade round for a few shillings, but actually these retail in the shops at £2 or £3. Similar instances could easily be quoted.

Regarding the price of electricity for domestic purposes, there is no evidence from electrical journals that the supply industry is bringing down prices as the number of consumers increases, certainly not in the systematic manner advocated by Mr. Ford. In his book "My Life and Work," Mr. Ford touches on this point as follows:—

"There is always buying power present, but that buying power will not always respond to reduction in price. If an article has been sold at too high a price, and then because of stagnant business, the price is suddenly cut, the response is sometimes most disappointing, and for a very good reason. The public is wary. It thinks the price cut is a fake, and sits around waiting for a real cut. If, on the contrary, the economies of making are transferred at once to the price, and if it is known that such is the policy of the manufacturer, the public will have confidence in him and respond. They will trust him to give honest value. So standardisation may seem bad business unless it carries with it the plan of constantly reducing the price at which the article is sold. And the price has to be reduced (this is very important) because of the manufacturing economies that have come about and not because the falling demand indicates that it is not satisfied with the price. The public should always be wondering how it is done. . . .

"If the prices of goods are above the incomes of the people, then get the prices down to the incomes. Ordinarily, business is conceived as starting with a manufacturing process and ending with a consumer. If that consumer doesn't want to buy what the manufacturer has to sell him, and has not the money to buy it, then the manufacturer blames the consumer, and says that business is bad. No one will deny that if prices are sufficiently low, buyers will always be found, no matter what are supposed to be the business conditions. . . .

"Consumption varies according to the price and quality, and nobody knows or can figure out what future consumption will amount to, because every time a price is lowered, a new stratum of buying power is reached. Everybody knows that, but many refuse to recognise it by their acts. . . .

"Some men reason that the best price to sell at is the highest price which may be had. That is supposed to be good business practice. We have not found it so. Our policy is to reduce the price, extend the operations and improve the article."

It should be added that the foregoing quotations are expressly noted as applying to business generally, and not purely to the production of cars.

The pace of future development in domestic electrification depends largely on the price of apparatus and energy. At present about 18 per cent. of the houses of Britain are wired, and the consumption *per capita* is perhaps 50 units per annum. The ultimate goal is 100 per cent. of the homes wired and a consumption *per capita* of, say, 1,000 per annum. The first step is to get a uniform tariff throughout the country, subject to local adjustments, and capable of revision every twelve months, calculated on the previous twelvemonths' working. The E.D.A. would render a real service to the industry if it could devise such a tariff which, to be absolutely fair, must be a two-part tariff, as only by this means does a consumer pay a lower price per unit as he increases his consumption. Such a tariff consistently reduced would in time absorb all those who at present are forced to use a flat rate. In view of the very large number of slot meters installed, it would be possible to arrange a modified system of rebates to encourage the greater use of electricity in homes where, without this incentive, any increase of consumption is very unlikely.

There have been a number of articles in the Press recently on tariffs showing what is being done in Switzerland, America, and other countries. (*En passant*, why do people affirm that electricity in the States is no cheaper than it is in this country? In New York the flat rate is 6 cents a unit, in our money 3d., but, based on the cost of living, this corresponds to 1½d., which is very much cheaper than anything in this country.) With such a tremendous field for development, it is surely much too early to go in for a complicated system of charges. When the 18 per cent. has reached 90 per cent. (and a long way off that appears on the present method of procedure), then will be the time to go in for preferential tariffs. At the present state of development the two-part tariff is sufficiently useful and lends itself readily to preferences by rebates, and also to readjustment as the load and number of consumers increases.

It is often argued that the cost of the low-pressure networks is the principal cause of high prices, but Messrs. Beard and Haldane, in their paper on "The Design of City Distribution Systems, and the Problem of Standardisation" (I.E.E. *Journal*, January, 1927), give a figure of £5 per kVA on a well-developed network, for interest on capital, depreciation, maintenance, &c. Allowing 80 per cent. load factor, this means a price per unit of .17d. This does not include generation, management, or h.p. distribution charges, but seeing that these should be divided between industrial and domestic development, it is obvious that the future possible figure can reach a small fraction of a penny.

Mr. Ford, while stressing the importance of price, lays great stress on the importance of eliminating waste, and also on simplification. There is a good deal to be done for domestic electrification in this direction. The poor load factor and low service density, with resultant idle mains and transformers, is probably the biggest cause of waste, while the complication of tariffs, metering, and time switches is, at the present moment, entirely unwarranted.

A few concerns have led the way, Darlington perhaps having made the greatest effort. It is to be hoped that all interested in the industry will emulate Mr. Ford's noble example. He has succeeded in everything he has put his hand to, because his principles are right, and there is no reason why the electrical industry as a whole, with such a tremendous field for expansion, should not build itself up on similar lines. "The wealth of a nation is what it produces," and therein lies the strength of the electrical industry.

Power Gas from Sewage Sludge.

In a paper under the above title by Messrs. Frank C. Vokes, B.Sc., and C. Bruce Townend, B.Sc., abstracted in the *Gas World*, which was to be brought forward for discussion at the Institution of Civil Engineers, some particulars are given of the collection and utilisation of gas obtained from the sewage sludge at the works of the Birmingham Tame and Rea District Drainage Board, where 400,000 tons of crude sludge is dealt with each year. The sludge is pumped, in turn, to primary and secondary digestion tanks and drying beds. About 25 to 33 per cent. of the solid matter is converted into a gas mixture having a calorific value of about 625 B.th.u. per cu. ft. As the result of investigations made on the working of a 34-b.h.p. gas engine installed at the Colehall works in 1921 and driven by the sludge gas, a 150-b.h.p. vertical gas engine, driving a 100-kW, 4,000-V alternator, and modern gas-collecting plant were installed and officially put into service in September last. Under favourable conditions the estimated cost of production of energy by this plant is 0.49d. per unit, effecting a net saving of over £1,000 per annum. The estimated cost of gas production on the basis of 16,000,000 cu. ft. per annum is 7½d. per 1,000 cu. ft. of gas of the calorific value stated. The estimated annual available output of energy, at the works is 10,000,000 h.p.-hours or about five times the Board's present requirements.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

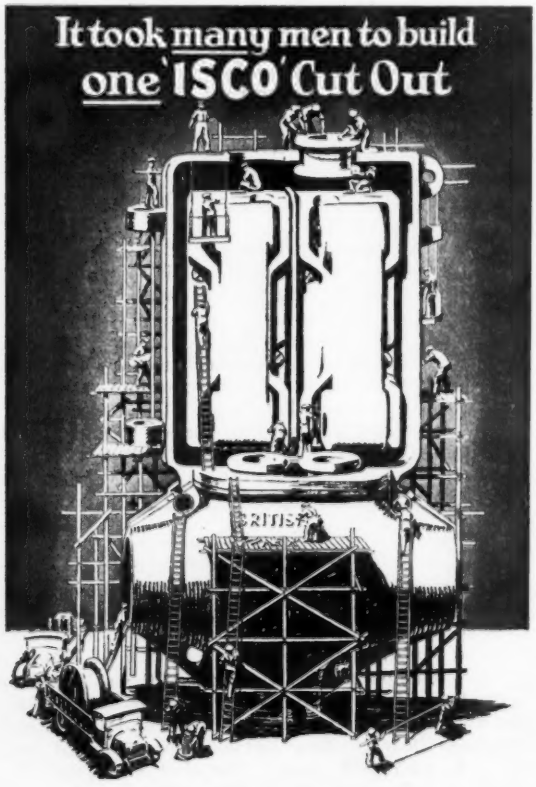
Electrical Review Index.

The index to Vol. CI (for the half-year ending December 31st, 1927) will be published shortly, and we shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.4.

Effective Series Advertising.

Many of our readers will remember the series of advertisements, dealing with the electrical and mechanical construction and features of ISCO ironclad service cutouts, six of which were successful in winning a special prize in our advertising competition last year.

A further series of twelve advertisements has now reached us from Messrs. Henley's which are characteristic in their



A New "Henley" Advertisement.

originality both for lay-out and general treatment. We are able to give in reduced scale a copy of the first of this series which is to appear in the Electrical Review shortly. A very bold and original treatment, it contains just sufficient wording to tell the story—while the picture has an abundance to tell. We are confident that the others will attract considerable attention when they appear in our pages.

The E.D.A. Circle Campaign.

A considerable amount of effective propaganda is being carried on by the Shropshire, Worcestershire & Staffordshire Electric Power Co. in its area. An electrical exhibition was held for a week at Tewkesbury, in connection with the shopping week organised by the local Chamber of Commerce, and this attracted a large number of visitors from Tewkesbury and the outlying villages. Commencing early in the New Year the company proposes to hold similar exhibitions at a number of small towns and villages in the more rural parts of the area. The first of these is to be held at Pershore, Worcestershire, about the second week in January. In addition to, and in conjunction with, these exhibitions, the company is arranging kinema shows at which films will be shown depicting in an interesting manner the many applications of electricity in the home, on the farm, and in the factory.

A Report on Northern Africa.

The Department of Overseas Trade has published through the Stationery Office (4s. 6d. net) a composite report by British Consular officials upon conditions in various North African countries. From this we have extracted a few notes on electrical matters. It is stated that work is still proceeding on the hydro-electric station at Sidi Machou (French Zone of Morocco), the first of those contemplated in the electrical concession granted in 1923. There has been talk of the eventual supply of electricity for general agricultural purposes, but this must be regarded as an indefinite future prospect. During 1926 dynamos to the value of 4,139,000 fr. were imported into the French Zone; these came mainly from France, Great Britain's share being valued at only 1,000 fr. The value of imported copper wire and cable (mainly from France and Belgium) was 3,481,000 fr. The Algerian report states that the telephone service between Algiers and Tunis is in admirable working order. There are similar communications between Algiers and Oran, and it is hoped that the service between Oran and Rabat will shortly be completed, thus placing the whole of the North African coast line in direct telephonic communication. After a lull during the immediate post-war years, electrical development in Tunisia is reviving, and the following towns have an electricity supply: Tunis, Sousse, Sfax, Bizerta, Béja and Ferryville. New generating stations are being built.

Local Exhibitions.

Boston.—We have received from the Boston and District Electric Supply Co., Ltd., photographs of an exhibition held in the district from December 6th to 10th. One of these, reproduced herewith, illustrates the stage of the hall in which the display was held. This was furnished with examples of electric cookers upon which were cards explaining the company's hire terms. There was also a washing machine, a vacuum

Electrical Exhibition at Boston, Lincs.

cleaner, and many smaller appliances. Demonstrations of electric cooking were given twice daily. The other photograph is a view of the main body of the hall which was divided up into compartments appropriately furnished for the exhibition of lighting fittings and appliances for use in the various rooms of a house.

Birkenhead Corporation Electricity Department recently held an exhibition of electrical apparatus in the Assembly Rooms, Heswall. In connection with the exhibition an interesting booklet containing a variety of details concerning hiring charges for electrical appliances and other information, has been published.

A Czecho-Slovakian Acquisition.

The Skoda Works Co., of Pilsen, has recently acquired the electrical engineering business of Bartelmus Donat & Co., of Brunn.

The Wireless Retailers' Association.

This Association has instituted a scheme with a view to preventing the granting of discounts on radio supplies to other than *bona-fide* wireless traders. A list has been received containing the names of over a hundred manufacturers and wholesalers who are supporting the scheme. The aim is to persuade members to deal only with firms upon the list, or to ask their usual wholesalers or manufacturers why their name is not included.

Irish Free State Electrical Imports.

The Irish Free State Ministry of Industry and Commerce has issued detailed figures of imports for the first nine months of the current year, comparing them with the corresponding period of 1926. From these we have compiled the appended table, showing the value of the total imports of electrical machinery and apparatus into the Free State and the amount attributed to the United Kingdom as country of shipment, but not necessarily of manufacture:—

	First 9 months.		U.K. share.	
	1927. £	1926. £	1927. £	1926 £
Electric wires and cables	84,959	81,402	33,980	47,720
Telegraph and telephone instruments and apparatus ...	31,104	33,003	24,320	28,897
Electric lamps and parts	31,990	40,157	26,694	37,216
Batteries and accumulators	25,536	26,401	24,502	23,414
Radio sets and parts	48,554	69,413	47,473	66,141
Other electrical goods and apparatus ...	57,746	77,311	44,184	50,153
Generators	9,283	24,277	8,703	7,263
Motors	14,385	28,907	11,161	17,242
Other electrical machinery	55,476	54,727	49,049	42,978
Totals	£359,033	£435,598	£270,066	£321,024

It will be seen that with the exception of electric wires and cables and "other electrical machinery," there has so far this year been a marked decline in the importation of electrical goods and machinery into the Free State, the nine months' total showing a falling off of £76,565, or nearly 19 per cent. Of the imports £270,066, or approximately 75 per cent., came from ports of the United Kingdom, leaving £88,967 for foreign countries. Of this balance £76,908 is credited to Germany, and £6,310 to the United States.

Peace in Industry.

At a special meeting of the Trades Union Congress General Council on December 20th, a letter from a group of influential employers was read and discussed. This letter stated that the signatories realised that the necessary industrial reconstruction could only be effected in co-operation with those entitled to speak for organised labour. It was therefore proposed that the T.U.C. should appoint representatives to meet the employers with a view to discussing with them a number of matters connected with the placing of industry on a sounder basis. The letter was signed by the following who, between them, represent industrial capital amounting to over £1,000,000,000:—Sir Alfred Mond, Bt., M.P., Lord Aberconway, Sir Herbert Austin, Mr. Bernhard Baron, Mr. Henry Bond, Lord Colwyn, Mr. David Davies, Sir Arthur Dorman, Sir Robert Hadfield, Sir Hugo Hirst, Mr. A. E. Humphries, Mr. Kenneth Lee, Lord Londonderry, Sir Edward Manville, Mr. M. Mannaberg, Sir D. Milne Watson, Sir Frederick Mills, Mr. W. Peter Rylands, Sir Josiah Stamp, Lord Weir, Col. F. Vernon Willey, Lord Ashfield, Mr. S. Courtauld, and Mr. G. C. Vyle. The General Council of the T.U.C. accepted the invitation, and appointed a special subcommittee to carry out the arrangements, under the leadership of Mr. Ben Turner, chairman of the T.U.C.

Sydney Preference Decision.

Tenders states that the Sydney City Council has decided to grant a preference of 15 per cent. on Australian-made goods and 10 per cent. on British over foreign-made articles when purchasing under quotation.

Polish Foreign Electrical Trade.

The *Board of Trade Journal* states that during October last the imports of "apparatus, conductors, and other electrotechnical materials" into Poland were valued at 4,168,000 gold fr. (about £167,000), while exports of the same class of goods had a value of 37,000 fr. (£1,500).

Electricity in Tin Mining.

Speaking at the annual meeting on December 20th of the Malayan Tin Dredging Co., Ltd., the chairman (Sir Ernest W. Birch) said that the electric power plant had worked well during the year under review. It had been calculated that when all the dredges were converted to electric drive there would be a saving in the fuel bill, as compared with steam power, of fully one-third. Fuel represented a substantial item of cost to the company and its reduction would be of the greatest value.

The British Empire Exhibition.

The winding-up of the British Empire Exhibition has now been completed. It is reported that only £4,448 of the call of £1,842,516 made upon the guarantors was not received. The guarantors are to receive back 9.82d. in the £.

The Season's Greetings.

We have received cards bearing seasonable greetings from the following:—The Chloride Electrical Storage Co., Ltd., Messrs. J. H. Tucker & Co., Ltd., Messrs. Davidson & Co., Ltd. (Belfast), the Westinghouse Electric International Co., Alloy Welding Processes, Ltd., and from Mr. J. H. Hindman, manager of the Brisbane Electricity Department, on behalf of the City Council.

New Belgian Companies.

Among the new companies recently constituted in Belgium are the following:—The S.A. Lampe Lion Belge, Velvorde, capital 300,000 fr., to manufacture electric lamps and accessories, machine tools, &c.; the S.A. Accuradio, Brussels, capital, 2,000,000 fr., to make and sell lead accumulators for lighting, automobiles and radio-telegraphy and accessories; the S.A. Le Carbone, Molenbeek-St. Jean, capital 450,000 fr., to manufacture carbon brushes, batteries, &c.; and the S.A. Le Neon, capital 750,000 fr., to manufacture electrical apparatus, &c., especially for lighting.

New Zealand Customs Tariff.

There was published with the *Board of Trade Journal* for December 22nd, a supplement containing the revised Customs tariff which has been introduced by the New Zealand Government. It is noted that the "intermediate" tariff which was provided for but never put into operation, has been abolished; the new tariff simply sets out the British preferential and general rates. Without giving full details, we may indicate that electrical machinery, insulated cables, switch- and control gear, radio receiving sets not mounted in cabinets, and several other items are admitted free of duty if of British origin, the duty on similar articles of foreign origin being subject to a duty of 20 per cent. *ad valorem*. The duty on broadcast receiving sets mounted in cabinets is 10 per cent. in the case of British goods and 30 per cent. for foreign goods. Incandescent lamps generally are subject to a graded specific duty "per bulb," the general rate being double the British preferential rate. Electric heating and cooking appliances are subject to an *ad valorem* duty of 20 per cent. if British and 40 per cent. if foreign.

"Exide" Research Scholarship.

An "Exide" Research Scholarship has been established at Manchester University, available for fourth year students willing to undertake original research work at the Physical Laboratories of the University, under Professor W. L. Bragg, F.R.S. The scholarship this year has been awarded to Mr. J. A. Darbyshire, who is carrying out, for the company, some original research on lead oxides.

New Italian Companies.

Among the concerns recently formed in Italy in connection with the electrical engineering industry are La Società Imprese Moroi "S.A.I.E.M.," Milan, capital 1,550,000 lire; La Società Lombarda Costruzioni Elettriche Telefoniche, "S.A.L.C.E.T.," Milan, capital 20,000 lire; La Società Fiat Lux, Florence, capital 200,000 lire: and La Società Ing. Felice Goffi & Co., Turin, capital 150,000 lire.

Municipal Contracting at Burnley.

At a recent meeting of the Burnley Town Council a councillor said that it was unfair for the Electricity Department to go into the open market and send out tenders, when electrical installation work could only be done by the department in workmen's houses. Another member said that so long as municipal enterprise was in fair competition with private traders he wished success to it. Alderman Nuttall said that recently the trustees of a church insisted on the Corporation tendering for electrical installation. The tender was not the lowest but was accepted. When the Corporation's Bill was before Parliament, it was provided that it was not allowed to spend ratepayers' money in any way to entail a loss. All charges had to cover expenses, nor could the Department go "touting" for business.

Works Extensions.

Messrs. TUNGSTONE ACCUMULATOR CO., LTD., report that the increasing demand for their battery has necessitated considerable extensions in plant and buildings, and they expect that they will be fully occupied with orders in 1928.

Unemployment.

During the week ended December 12th there was a fall of 24,450 in the number of registered unemployed. The total at the stated date was 1,125,200 as compared with 1,149,650 on December 8th and 1,410,380 on December 13th, 1926.

The Export Credits Guarantee Department.

Owing to the rapidly increasing use which is being made of the facilities provided by the Government under the Export Credits Guarantee Scheme, it has been found necessary for the Department to secure larger and more suitable accommodation. Communications should now be sent to the Manager, Export Credits Guarantee Department, 9, Clements Lane, Lombard Street, E.C.4. Telephone: Royal 8771.

Russian Production in 1927-28.

The General Electrical Commission of the U.S.S.R. has confirmed the programme of production for the current fiscal year (1927-28). The High-Pressure Trust (Get) is to produce goods to a value of 129,700,000 pre-war roubles or an increase of 36 per cent. over 1926-27. In machines alone the output is to be augmented by 46 per cent. The new "Transformer" works is to be brought into use this year. The Trust's costs of production are to be reduced by 8.05 per cent., and the average output per worker is to be increased by 20 per cent., with a wages advance of 8.5 per cent. In the case of the Low-Pressure Trust the production is estimated at 29,934,000 roubles or 67 per cent. more than in 1926-27, and this year is to witness the starting of the new works for the manufacture of measuring apparatus. The Accumulator Trust is to have an output valued at 5,713,000 roubles or an increase of 55 per cent., and the new Mos-element works is to be brought into activity. The costs of production are to be lowered by 6.02 per cent.; the average output per worker is to be advanced by 17.5 per cent. and the wages by 3.3 per cent.

Rating of Machinery in Aberdeen.

Aberdeen Town Council, sitting as an Appeal Court, has dismissed the appeals of a number of industrial firms against the rating of machinery in the assessment notices. It was claimed by appellants that, by a special Aberdeen Act, machinery was exempted from local rates.

Calendars, Diaries, &c.

A further supply of calendars, diaries, &c., has been received as follows:—

Messrs. ARTHURS, of 110, Charing Cross Road, London, W.C.2, have issued a set of six calendar cards for 1928, each of which contains two months' dates and a coloured humorous picture.

From the ENFIELD CABLE WORKS, LTD., we have received a calendar with monthly date sheets and an illustration of a 33,000-V "H" type cable produced by the company.

The "Exide Girl" (Barribal) again appears on the calendar of the CHLORIDE ELECTRICAL STORAGE CO., LTD., together with a set of monthly date slips. A poster bearing this design recently secured the ninth place in a South African exhibition in which several hundreds of posters were exhibited.

Messrs. B. S. & WHITELEY, LTD., of Pool Paper Mills, Pool, near Leeds, have sent us one of their wall calendars with daily slips each giving a quotation from the works of popular writers.

Messrs. MATHER BROTHERS' (Farringdon Street, E.C.4) calendar follows the lines of its predecessors, being equipped with a handy date-indicating device and monthly sheets.

A great deal of artistry is required to depict steam valves and gauges in an attractive manner. Messrs. HOPKINSONS, LTD., Huddersfield, have succeeded in doing this in their 1928 calendar. A view of the company's works also appears and the calendar is fitted with a novel indicating device.

The 1928 calendar of Messrs. LINDSAY & WILLIAMS, LTD., Ardwick, Manchester, is for utility. It has a block of large daily slips upon a black and white card.

The KEY ENGINEERING CO., LTD., has sent us its familiar celluloid vest pocket calendar for 1928.

A Tudor house (one of the few remaining in London) is depicted in black and white on the calendar sent us by Messrs. LIONEL ROBINSON & CO. Below the picture is a block of weekly date slips.

MESSRS. FRANCIS POLDEN & CO., LTD., have again sent us one of their very serviceable pocket diaries in dark red leatherette with fold-over flap. In addition to adequate diary space there are many memoranda pages. We have also received the company's 1928 calendar fitted with a neat date-marking device.

From Messrs. HUGH J. SCOTT (BELFAST), LTD., we have received a calendar blotter bearing an illustration of one of the company's motors.

Messrs. DORMAN & SMITH, LTD., Salford, have sent us a handsome ash tray. This takes the form of a bronzed-metal peacock with extended tail, and is very ornamental.

A useful wall calendar has been issued by Messrs. CROSSLEY BROS., LTD., of Manchester. An excellent half-tone view of one of their engines appears above a block of daily slips, with a few extra slips interleaved here and there containing interesting literary quotations.

A reproduction of a beautiful water colour drawing by W. H. Margetson, R.I., appears on the calendar of Mr. L. W. Foote, 30, Charles Street, Cardiff. The subject is "Elise at the Stream," illustrating an incident from one of Hans Andersen's stories.

Trade Announcements.

Mr. EDWIN CLINTON LEWIS has retired from the Lewis Electric Sedan Co., electrical engineers, of 72, Eastbank Street, Southport, and the business will be continued under the same style by Mr. Magnus Kinchin.

The ELECTRICAL EQUIPMENT & CARBON CO., LTD., has appointed Mr. E. L. Castle, Holly Mount, Station Road, Pendlebury, Manchester, as its representative for Lancashire and Cheshire.

MESSRS. RANGERS, LTD., who were incorporated in October last, have offices and showrooms at 307, Euston Road, N.W.1. They are agents for Electric Fires, Ltd., Norwich, and for "Ranger" dry batteries, immersion heaters, irons, &c. The sales department is under the direction of Mr. E. S. Hertz, who was formerly with Condor Lamps (Gt. Britain), Ltd., and Messrs. Charlesworth Peebles & Co.

From January 1st the address of the ELECTRICAL ACCESSORIES MANUFACTURERS' ASSOCIATION will be Kern House, 36, Kingsway, W.C.2. Telephone: Holborn 0502.

Messrs. PRIESTLEY & FORD, 3, Carrs Lane, Birmingham, have recently extended their premises and the electrical side of the business, which was entered upon a few months ago, is now being developed.

As most of our readers are aware by this time, the name of CABLE ACCESSORIES CO., LTD., has been changed to "THE REVO ELECTRIC CO., LTD," as the former title was no longer indicative of the company's activities.

On and after January 1st the works address of KLAXON, LTD., will be Warwick Road, Greet (nr. Tyseley Station, G.W.R.), Birmingham. Telephone: Acocks Green 951; telegrams: "Ediklaxos, Phone, Birmingham." The head office address is unaltered.

Mr. J. L. HARVEY, electrical engineer, has opened new premises in High Street, Swadlincote.

Owing to a fire which occurred on December 21st at the premises of Mr. L. N. BENNETT, wireless engineer, of 9, East Street, Herne Bay, the business will be carried on at 13, North Street.

Mr. I. F. BAKER, who has been promoted to manager of the Far Eastern Department of the Westinghouse International Co., goes to that position from Japan, where he was managing director of the Westinghouse Electric Company of Japan, president of the American Merchants' Association of Tokio, and acting president of the American Association of Tokio. His new offices will be in New York.

Mr. J. W. WHITE has been elected a director and managing director of the Westinghouse Electric Company of Japan. He has had wide experience with the Westinghouse Company, both in the United States and abroad, having been respectively general manager of the Japan Company, manager of the Power Section of the Detroit Office, and Manager of the Westinghouse International Company of Cuba.

New Catalogues and Lists.

WALTER'S ELECTRICAL MANUFACTURING CO., LTD., Kensal Road, N.W.10.—List No. 127, containing illustrated particulars and prices of linesmen's tools and equipment of all kinds.

THE HART ACCUMULATOR CO., LTD., Stratford, E.15.—An iridescent window sign (H.20) advertising the company's radio batteries. Also a folder dealing with starting and lighting batteries for various classes of cars.

BRITISH ENGINE, BOILER & ELECTRICAL INSURANCE CO., LTD., 56, Kingsway, W.C.2.—A card advertising the company's insurance and inspection services.

THE ENFIELD CABLE WORKS, LTD., 296-302, High Holborn, W.C.1.—A blotter illustrating the method of packing "Enfield" flexibles and small cables.

THE BRITISH SECHERON CO., LTD., Abbey House, 2, Victoria Street, S.W.1.—An illustrated brochure describing the construction of the company's transformers and a pamphlet giving an illustrated description of a.c. arc welding sets.

MESSRS. D. H. BONNELLA & SON, LTD., 46-48, Osnaburgh Street, Euston Road, N.W.1.—A leaflet bearing illustrations in natural colours of fancy enamel bell-pushes. Priced.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, E.C.4.—Catalogue No. 185, containing a fully illustrated description of the "Seelco" sheathed wiring system. Prices of all components and accessories are given.

THE DUNDEE ELECTRICAL REPAIRS CO., LTD., Guildhall Works, Erskine Street, Dundee.—Leaflet No. 6, illustrating and describing the company's rotor-starting switch.

Bankruptcy Proceedings.

G. G. PATERSON (trading as George Paterson & Sons), wireless parts factor, 107, Clerkenwell Road, E.C.—The public examination of this debtor was held on December 20th before Mr. Registrar Mellor at the London Bankruptcy Court, the accounts showing liabilities of £375 and no assets. The debtor stated that he started business in partnership at St. Paul's Road, Canonbury, in October, 1922, but found that the profits were insufficient and retired for a few months. He started the above business in November, 1925, with a capital of £500, but the trading was not a success and came to an end in May, 1926, when his principal creditors obtained judgment for £254 and removed the stock. In the same month McWhirr, Paterson & Co., Ltd., was registered to carry on a similar business at Highbury; he held one share and was appointed managing director, but the company was not successful and went into liquidation in March, 1927. The debtor attributed his insolvency to bad trade, loss in trading and by betting. The examination was concluded.

A. M. EDWARDS, 111b, High Street, Blackwood, Mon., electrical engineer, trading as Mansell Edwards & Co.—The first meeting of creditors was held on December 22nd, at Cardiff, when the case was left in the hands of the Official Receiver as trustee of the estate. The statement of affairs showed liabilities of £360, against assets of £38, leaving a deficiency of £322. The debtor said that his failure was due to under cutting in prices, &c.

A. H. SMITH, wholesale electrical distributor, 13, Park Place, Cardiff.—Composition of 5s. in the £ on all provable debts to be deposited with the Official Receiver and payment in priority

of all debts directed to be so paid and provision for the payment of all charges, costs, expenses, and fees. Receiving order discharged.

G. MASON & G. E. TINSLEY (Mason & Tinsley), electrical engineers, 6, Alberta Terrace, Sherwood Rise, and lately trading at 94, Upper Parliament Street, Nottingham. Trustee, Mr. L. A. West, Official Receiver, 4, Castle Place, Nottingham, released December 12th.

P. CALLAND, electrician, late of The Cross, Bromborough, Chester.—Receiving order made December 15th on debtor's own petition.

J. T. NICHOLS, wireless parts merchant, 4, Glebe Road, Kingsland Road, Dalston.—Application for discharge to be heard January 20th at Carey Street, W.C.

A. J. WELLS (lately carrying on business in partnership with W. Bashford, Wells & Co.), electrical engineer, 52, Princess Street Luton.—Application for discharge to be heard February 9th at the Court House, Luton.

Company Liquidations.

HERRICK DURELL & CO., LTD., electrical engineers and contractors, 92, Park Street, Camden Town, N.W.—The first meetings of creditors and shareholders were held on December 23rd, at Carey Street, W.C., Mr. G. D. Pepys, Official Receiver, presiding. A compulsory winding up order was made on November 22nd, 1927, and accounts had been lodged showing liabilities of £2,973, against assets of £527, and a deficiency of £3,149 with regard to contributories. The company was incorporated as a private company in 1924, with a nominal capital of £3,000. and the issued capital amounts to £703. The object of the company was to acquire and continue a business of electrical engineers and contractors previously carried on by Roland Herrick. The directors included S. L. Durell, who states that Herrick and he had been directors of Evans (Electrical), Ltd., which had carried on business until a receiver for debenture holders was appointed in May, 1924. Herrick then started the business taken over by this company for a consideration of £800, which was satisfied in cash and shares. The main business of the company was contracting for electrical installation work. There was also a number of maintenance contracts, usually for a period of one year, but most of these were not renewed, and work was continued without any definite arrangement as to terms. A debenture for £1,650 was issued in August last, and on September 14th Mr. C. A. Dodds was appointed receiver and manager on behalf of the bondholder, but on the making of the winding up order the receiver recognised that the debenture was invalid, it having been issued within three months of the presentation of the petition and for a past consideration. The failure of the company is attributed to the taking of premises at Park Street and the consequent loss on trading there; also to excessive overhead charges. A resolution was passed by the creditors for the appointment of Mr. G. H. Hawkins as liquidator, but it was not confirmed by the shareholders, and the matter will be referred for decision to the Registrar.

BROMLEY (KENT) ELECTRIC LIGHT & POWER CO., LTD.—Winding up voluntarily. Liquidators, Mr. A. N. Rye, Broad Sanctuary Chambers, Westminster, S.W., and Mr. C. H. Jones, 67, Hayes Road, Bromley. Meeting of creditors January 5th, at Broad Sanctuary Chambers, Westminster, S.W. (This notice is purely formal. All creditors have been or will be paid in full.) Particulars of claims to Mr. A. N. Rye, Broad Sanctuary Chambers, by January 31st.

NOTABLE ELECTRIC CO., LTD.—A petition for the winding up of this company has been presented to the High Court by Messrs. M. Dunn, Ltd., of 11, Princes Street, Hanover Square, W. Creditors will be heard in London on January 16th.

UNITED VACUUM CLEANER CO. (1918), LTD.—Winding up voluntarily. Liquidator, Mr. F. G. Fuke, 55, Hook Road, Surbiton. Meeting of creditors January 6th, at 17, Dacre Street, Westminster, S.W.

AFRICAN TRANSCONTINENTAL TELEGRAPH CO., LTD.—A meeting of members is called for January 24th, at the office of the British South Africa Co., 2, London Wall Buildings, E.C., to hear an account of the winding up from the liquidator, Mr. P. J. Baird.

JENNER LIGHT & POWER CO., LTD.—A meeting of members is called for January 26th, at 1 and 2, Bucklersbury, E.C., to hear an account of the winding up from the liquidator, Mr. R. McKerrow.

NORTON WIRELESS CO., LTD.—First meetings of creditors and contributories January 6th, at Carey Street, W.C.

CHARLESWORTH PEEBLES & CO.—First dividend of 4s. 6d. in the £ payable at the office of the liquidator, Mr. S. H. Gillett, 24, Basinghall Street, E.C.

SHERINGHAM DAYLIGHT CO., LTD.—A meeting of members is called for January 26th at Bartlett House, 9, Basinghall Street, E.C., to hear an account of the winding up from the liquidator, Mr. G. S. Farebrother.

Dissolutions of Partnership.

ESTALITE ELECTRIC SUPPLIES, Camden Chambers, Camden Street, N. Shields.—Mr. M. Simon and Mr. H. Caplan have dissolved partnership. Mr. Caplan will attend to debts.

FURNEAUX & THOMAS, electrical and mechanical engineers, Victoria Road, Swansea.—Mr. A. G. Thomas and Mr. J. Morgan have dissolved partnership as far as concerns Mr. J. Morgan, who retires from the firm.

DUNCAN DAVEY & SONS, builders, electrical and sanitary engineers, &c., Meadow Road, Loughton, and 7, Leadenhall Street, E.C.—Messrs. P. A., D. J., H. S. and L. A. Davey have dissolved partnership. Messrs. D. J., H. S. and L. A. Davey will attend to debts and continue the business.

COUSINS & ELLIS, hardware and electrical factors, 189, High Road, Balham, S.W.—Mr. C. Coveney-Cousins and Mr. R. T. Ellis have dissolved partnership. Mr. Coveney-Cousins will attend to debts and continue the business.

Private Arrangements.

ALFRED WHITE, electrical engineer, 4, Norfolk Street, Sunderland.—A meeting of creditors was held on December 16th, when a statement of affairs was presented which showed liabilities of £2,623, of which £2,593 was due to unsecured creditors and £30 to a partly secured creditor. The net assets were £2,400, leaving a deficiency of £223. It was stated that the debtor consulted his creditors in April, 1923, when it was decided that a deed of inspectorship should be executed and that the debtor should continue trading. Since that time the debtor had paid a dividend of 5s. in the £, and there was now owing in respect of the old accounts a sum of £1,629. The liabilities for new goods were £894, bringing up the total to £2,593. A fire broke out on the premises in November last, and a claim had been lodged with an insurance company. Since April, 1923, the trading had resulted in an approximate loss of about £30. During the year to April, 1924, the sales were £12,500, and in the following year they fell to £8,230, and in the succeeding 12 months to £7,000. During the year to April last the sales still further declined, and since April, 1927, they had been £2,075. A deed of assignment had already been executed in favour of Mr. W. Davison, C.A., of West Sunniside, Sunderland, and the creditors decided to confirm this.

H. E. HAWLEY and F. A. INGRAM, electrical engineers, trading as Hawley & Ingram, Stoke-on-Trent.—A meeting of creditors was held recently at Stoke-on-Trent. The statement of affairs presented showed ranking liabilities of £3,633, of which £3,351 was due to the trade, and £282 to a partly-secured creditor. The net assets were £1,891, leaving a deficiency of £1,742. The separate estate of H. E. Hawley disclosed ranking liabilities of £84, and a deficiency of £40. That of F. A. Ingram showed ranking liabilities of £78, with a deficiency of £18. The debtors commenced trading in June, 1923, when they each introduced a sum of £100. Apparently that capital was borrowed. The book debts represented a large number of small items, and the work in progress consisted of ten contracts on which considerable work had been done. Accounts dated June, 1925, disclosed a profit of £250. During the following year there was a loss of £60, and since June of last year there had been a loss approaching £1,000. The drawings had been moderate. The business was a growing one, and was a potentially profitable concern. Owing to pressing creditors a deed of assignment had already been executed to Mr. J. C. Sandlands, Stoke-on-Trent. A resolution was passed confirming the deed, and a committee of the principal creditors was appointed.

New French Company.

With the title La Société d'Etudes des Forces Hydrauliques de la XVII Région Economique, a new concern has lately been formed at Clermont-Ferrand, with a capital of 600,000 francs, to prepare plans for the utilisation of the water power resources of what is known as the "Seventeenth Region" of France.

Social Events.

On December 21st the staff and friends of the HART ACCUMULATOR CO., LTD., met at their annual dinner at the Holborn Restaurant. Mr. F. J. Holmes, managing director, was in the chair, and other members of the board were present. In proposing the toast of "Prosperity to the Hart Accumulator Co., Ltd.," Sir John Prestige, chairman, said that competition in the accumulator business had become very keen both from home and foreign manufacturers. The company had constantly to consider means of reducing the costs; that had been done without interference with wages. Suggestions of economies in working by the staff were always welcomed. In conclusion he referred to the serious illness of Mr. Clark and said he would convey a message to him from the company. In replying to the toast, Mr. Holmes said that the company had completed 29 years of work and that period had been marked by a policy of continuous purpose. The health of the guests was proposed by Mr. S. Grainger, and replied to by Mr. C. Croom-Johnson. The thanks of the gathering were conveyed to the organising committee by Mr. J. Breeze, and Mr. E. F. Dunkerton responded. An excellent musical programme was provided by Miss Bessie Jones, and Messrs. Morlais Morgan, Will Gardner and Jock Walker, with Mr. Frederick Arthur at the piano.

At Cannock, Staffordshire, recently, a dance was organised by Messrs. Ball Bros., local radio dealers, in conjunction with the British Thomson-Houston Co., Ltd., and Mr. Thomas, the proprietor of the Queen's Hall, Cannock. Nearly 500 people were enabled to dance to music by the Ciro's Club and Kettners' dance bands, reproduced by two Rice-Kellogg loudspeakers.

The directors of Messrs. Heyes & Co., Ltd., Wigan, entertained their staff and employés at a social evening on December 22nd, at the Court Hall. The social took the form of a tea, whist drive, dance and entertainment, and was a source of enjoyment to all the guests. Among those present were Mr. W. A. Heyes (governing director), Mrs. W. A. Heyes, Mr. A. V. Heyes (managing director), Mr. O. J. Davis (director), Mr. J. W. Cartwright (works manager), and Mr. J. C. Muir (secretary).

On December 20th a social evening and dance was arranged for their employés by Messrs. H. E. Ashdown, Ltd. Over 180 joined in the dancing and games, prizes being provided by the firm for the various items. At the close the prizes were presented by Mrs. Ashdown.

The Badminton section of the G.E.C. Social and Athletic Club held its annual Christmas dance on December 16th, when there was an excellent attendance. The arrangements were in the hands of Mr. Burville.

Book Notices.

"Lineas Aereas de Transmision" is the title of a booklet issued in Spanish by the British Aluminium Co., Ltd., London, explaining the uses of steel-cored aluminium cable for electrical purposes and giving full information and technical data for the design and erection of transmission lines employing this type of cable.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLVI. December, 1927. No. 12. New York: The Institute. Price $1.

"Science Abstracts (A and B)." Vol. XXX. Part 12. December 25th, 1927. London: E. & F. N. Spon, Ltd. Price 3s. each.

Swiss Activity in South America.

Escher, Wyss & Co., of Zurich, have recently established a technical office in Santiago to deal with inquiries for electrical and hydraulic plant in Chile, Bolivia, and Peru.

Swedish Electrical Exports.

The *Swedish Economic Review* (the official organ of the Swedish Board of Trade) states that during the first ten months of 1927 electrical machinery to the value of 25,899,000 kr. (£1,439,000) was exported from Sweden, as compared with 21,671,000 kr. (£1,204,000) in the corresponding period of 1926. During the same period the exports of telephone and telegraph apparatus were valued at 7,217,000 kr. (£400,000), as compared with 5,917,400 kr. (£330,000).

Provincial Electric Supply Association.

The tenth annual meeting of this Association took place at the Holborn Restaurant on December 16th, and was presided over by Sir Harry Renwick, Bt., K.B.E. The meeting was preceded by a luncheon, to which over 30 representatives of the member-companies accepted invitations. The Association comprises as members practically the whole of the electric lighting companies throughout the Kingdom, outside London, and represents over 25 millions of capital expenditure. Sir Harry Renwick, in his address, reviewed the effect of recent legislation, and enlarged upon the necessity for facilitating rural supplies and overhead lines, mentioning that further legislation might be necessary on these and other matters. A vote of thanks to Sir Harry Renwick was proposed by Mr. Spencer Hawes (Reading Company), and supported by Mr. Rye (Edmundson's Electricity Corporation).

Great Britain's Radio Exports.

Statistics published in the *Wireless Trader* show that during October the total value of radio apparatus exported from this country was £93,476, including valves £15,760. Australia was the principal customer, taking goods to the value of £11,746 (valves £5,220); Poland was a close second with a total of £11,142 (valves £1,232). Other important customers were the Netherlands, £7,448 (valves £961); Japan, £6,383 (valves £1,069); Canada, £4,922 (valves £473); and the Irish Free State £4,402 (valves £944).

Recent Contracts.

The London Underground Railways have recently placed a further important order for self-ventilated railway motor and "multiple unit" type control equipment with the GENERAL ELECTRIC CO., LTD. This follows upon the series of orders for similar equipment already executed, or in progress of manufacture for this railway. The present order covers 382 railway motors, type WT.54, each rated at 240 b.h.p., on the one-hour rating, and "all-electric," automatic acceleration, multiple control equipment for 63 motor coaches and 107 trailer cars. On the completion of the present order, G.E.C. traction apparatus will have been installed on 628 coaches of the "Underground" system.

Messrs. HOLLINGS & GUEST, LTD., have secured a contract for a large hydraulic plate flanging press for the Peking-Mukden Railway. They also have in hand a repeat order for a large hydraulic baling installation for Ceylon, as well as a big pumping plant for the Birmingham Tame & Rea Drainage Board, which is a repeat order.

Employment During November.

The December *Ministry of Labour Gazette* reports that employment in the engineering industry during November remained slack on the whole, although there was a little improvement in some sections. Unemployment in the industry generally decreased from 9.2 to 9.0 per cent., while in the electrical section there was an improvement from 4.6 to 4.3 per cent., and conditions in that section are described as "fairly good." The state of the engineering industry was much better than in November, 1926, when it was badly affected by the coal-mining dispute. There was a further improvement in the electrical wiring and contracting industry, the unemployment figure falling from 5.2 to 5 per cent. After four months of improvement, employment in the electric cable, wire and lamp manufacturing group showed a slight decline; the proportion of unemployed rose from 5.1 to 5.2 per cent.

The actual numbers of unemployed in the branches mentioned on November 21st were as follows:—Engineering, 90,012; electrical engineering, 3,384; electrical wiring and contracting, 743; electric cable, wire and lamp manufacture, 4,364.

Price Reduction.

The GENERAL ELECTRIC CO., LTD., announces the reduction of the price of its "Robertson" flame-coloured heating lamps to the same price as the frosted type.

Stewarts & Lloyds in Australia.

It is stated that the proposal of Messrs. Stewarts and Lloyds to erect a tube-making plant in Australia is in abeyance pending a decision by the Commonwealth Government upon the question of tariffs. If the Government decides to raise the import duty upon tubes the establishment of a works would be definitely considered.

For Sale.

Messrs. Fuller, Horsey, Sons & Cassell will sell by auction, on January 31st and following days, on the premises at Bolton, the entire contents of the Globe Iron Works of John Musgrave and Sons, Ltd., Bolton.

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price December 28th	Fortnight's inc. or dec.
a	Acid, Oxalic	per lb.	5¾d.	...
a	Ammoniac, Sal	per ton.	£60	...
a	Ammonia, Muriate (large crystal)	,,	£82	...
a	Bisulphide of Carbon	,,	...	...
a	Borax	,,	£25	...
a	Copper Sulphate	,,	£25 10s.	...
a	Potash, Chlorate	per lb.	3½d. to 4d.	...
a	,, Perchlorate	,,	5½d.	...
a	Shellac	per cwt.	£13 10s.	...
a	Sulphur, Commercial	,,	£11	...
a	,, Roll	,,	£11	...
a	Soda, Chlorate	per lb.	3d.	...
a	,, Crystals	per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ...	per lb.	3¾d.	...
	METALS, &c.			
b	Aluminium, Ingots	per ton.	£107 to £112	...
b	,, Wire	per lb.	1/6 to 2/-	...
b	,, Sheet	,,	1/3 to 2/9	...
p	Babbitts Metal and Anti-friction Metal—			
	Grade I	per ton net.	£236	...
	Grade II	,, ,,	£162	...
	Grade III	,, ,,	£83	...
c	Brass (rolled metal 2" to 12" basis)	per lb.	9¾d.	...
c	,, Tubes (solid drawn)	,,	11¼d. to 11¾d.	...
c	,, Wire, basis	,,	9¼d.	...
c	Copper Tubes (solid drawn) ...	,,	1/0½	...
c	,, Bars (best selected) ...	per ton.	£90	...
c	,, Sheet	,,	£90	...
c	,, Rod	,,	£90	...
d	,, (Electrolytic) Bars ...	,,	£67	7/6 inc.
d	,, ,, Sheets	,,	£143 10s.	...
d	,, ,, Wire Rods ...	,,	£77	7/6 inc.
d	,, ,, H.C. Wire	per lb.	9¾d.	¼d. inc.
f	Ebonite Rod	,,	2/3 to 2/6	...
f	,, Sheet	,,	2/3 to 2/6	...
n	German Silver Wire	,,	2/2	...
h	Gutta-percha, fine	,,	6/3	...
h	India rubber, Para fine	,,	1/5	...
l	Iron Pig (Cleveland No. 3.) ...	per ton.	75/-	...
l	,, Wire, galv. No. 8, P.O. qual.	,,	£21	...
g	Lead, English pig	,,	£23 10s.	5/- inc.
g	Mercury	per bot.	£23	...
e	Mica (in original cases) small ...	per lb.	3d. to 3/-	...
e	,, ,, medium	,,	4/- to 8/-	...
e	,, ,, large ...	,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings	,,	1/3½	...
p	,, ,, drawn bars & rods	,,	1/3	...
p	,, ,, rolled strip & sheet	,,	1/2½	...
p	,, ,, wire...	,,	1/3½	...
o	Platinum	per oz.	£14 10s.	...
d	Silicium Bronze Wire	per lb.	10½d.	...
r	Steel, Magnet, in bars	,,	7½d.	...
n	Tin, Block (English)	per ton.	£265 to £265 10s.	...
n	,, Wire, Nos. 1 to 16	per lb.	4/2	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Lighting and Power Notes.

Aylesbury.—ELECTRICITY SUPPLY.—The Town Council has arranged to give a supply of electricity to the new works of Messrs. Hunt, Barnard & Co., and has applied to the Electricity Commissioners for sanction to a loan of £610 to cover the cost of the rotary convertor to be installed in connection with the supply.

Bedford.—MAINS EXTENSION.—The Corporation Electricity Committee is to extend mains, at a cost of £2,500, for the supply of electricity in the parish of Maulden.

Birmingham.—RECORD OUTPUT.—At a recent meeting of the Electric Supply Committee, it was reported that all previous records with regard to output had been broken. During November 1,321 additional premises had been coupled up to the mains (the largest number in the history of the undertaking), representing 17,300 additional lamps and 2,250 h.p. in supplies. A recent week's output from the power stations had established a new record, being nearly 9,000,000 kWh, which was 26 per cent. above that of the corresponding week last year. This record output equals the total year's sales in Birmingham 21 years ago.

Blackpool.—ELECTRICITY SUPPLY PROGRESS.—The output of the Corporation electricity station during November was 2,936,127 kWh. During the eight months, April to November, inclusive, the output was 18,102,839 kWh, an increase on the corresponding period of last year of 3,584,252 kWh. The number of new consumers connected since April is 1,324, an increase of 142 as compared with the same period last year.

Bovey Tracey. — PURCHASE OF UNDERTAKING. — It is announced that arrangements have been made for the purchase of the undertaking of the Dartmoor Electric Supply Co., Ltd., at Bovey Tracey by the Teignmouth Electric Lighting Co., Ltd., which recently obtained from the Electricity Commissioners an Order to supply a number of parishes in Mid-Devon. Electricity will be obtained from the Torquay Corporation's generating station at Newton Abbot, and will be distributed by the Teignmouth Company over an 11,000-V line. A consumers' committee at Bovey Tracey has been informed that when the new system comes into operation on March 31st the charge for electricity will be reduced from 1s. 4d. to 10d. per kWh.

Cheshire.—ELECTRICITY SUPPLY.—According to the *Manchester Guardian*, it is now recommended that the area of supply of the new Joint Electricity Board for the urban areas of Wilmslow and Alderley Edge should include Chorley, Great Warford, Styal, Handforth, and a larger part of Nether Alderley than that served by the local company, and it seems likely this will be agreed to. The Councils of Wilmslow and Alderley Edge have decided to purchase all the properties of the company, and it is expected that cheaper electricity will be provided. The question of applying for a Special Order is now being considered, and steps will probably be taken early in the New Year. This Order will authorise the Joint Board to supply electricity for all public and private purposes throughout the urban districts of Wilmslow, Alderley Edge, and Handforth, the parish of Styal in the rural district of Bucklow, the parishes of Chorley and Great Warford, and part of the parish of Nether Alderley in the rural district of Macclesfield.

Continental.—FRANCE.—The Compagnie des Mines de Marles has recently placed a contract with the Société de Alsacienne de Constructions Mécaniques, of Belfort, for a new steam turbo alternator, with a capacity of 15,000 kW, for its electric power station at Chocques. The new set will bring the capacity of the plant up to 40,000 kW.

A concession has recently been granted by the French Government for the establishment of a plant to utilise the water power of the River Neste d'Oo, near Bagneres-de-Luchon, in the Department of Haute Garonne.

The first 20,000-kW steam turbo-alternator designed to run at 3,000 r.p.m. to be constructed by the Société Alsacienne de Construction Mécaniques, Belfort, was recently put into operation at the Mouche electric power station of the Compagnie du Gaz, Lyons. The generator is of the company's standard type designed to develop 28,600 kVA at 10,000-11,000 volts, but the turbine is of a new design intended to operate with steam at a pressure of 12 kg. per sq. centimetre (170 lb. per sq. in.) and a temperature of 300 deg. C. at the admission valve.

HUNGARY.—The Hungarian Transdanubian Electricity Co. has signed all the contracts in connection with the great central power station to be erected at Banhida, which is known as the "Talbot station." The company has applied to the British Treasury for a loan under the Trade Facilities Acts.—*Reuter* (Budapest).

HOLLAND.—The power station at the Dutch State collieries at Haarlem is being enlarged by the addition of a 28,500-kVA, 10,500-V alternator, the contract for which has been placed with the Société des Ateliers de Construction Electriques de Charleroi, Belgium.

SPAIN.—A hydro-electric station is being erected to utilise certain falls on the River Alloz, in the Province of Navarra. The contract for two turbines, one of 8,820 h.p. and the other of 2,720 h.p., has been placed with Theodore Bell & Co., of Kriens, Lucerne, Switzerland.

POLAND.—The Société de l'Usine Electrique de Piotrkow has secured a concession for a supply of electricity in Tomaszow. A 35,000-V transmission line is being erected between the two towns.

Crewkerne.—ELECTRICITY SUPPLY.—The Urban District Council has discussed with Mr. Purves and Captain E. R. F. Colebrd and Mr. Perks, of the Power Development Co., Ltd., the question of the Council supporting their respective applications to the Electricity Commissioners for Orders embracing its area in proposed electricity schemes. It was eventually decided that the Council should support the application of the Power Development Co., Ltd. The company proposes to lay a cable from Axminster to Chard, across to Ilminster, Langport, and Martock, back to Crewkerne, through Beaminster to Bridport, and back to Axminster.

Devon.—ELECTRICITY SUPPLY.—The amalgamation is announced of the Cullompton and Bradninch Electric Supply Companies, and a scheme is to be carried out by which electricity will be supplied to Broadclyst and Hemyock and intervening villages, with loops to Halberton, Hockworthy, Holcombe Rogus, Kentisbeare, Blackborough, and other places

Douglas (I. of M.).—ELECTRICITY IN BULK.—The Corporation Electricity Committee is in negotiation regarding a bulk supply of electricity to the Douglas Southern Electric Tramways, Ltd.

East Ham.—NEW PLANT.—The Corporation Electricity Committee has decided to install an additional convertor, at an estimated cost of £4,820.

CHANGE-OVER.—The Committee is to change over the system of electricity supply in the Manor Park area from d.c. to a.c., at an estimated cost of £19,000.

Glasgow.—CENTRAL SCOTLAND SCHEME.—At a meeting of the Corporation Electricity Special Sub-Committee on the Central Scotland Electricity Scheme, 1927, the manager submitted a statement of the estimated cost of giving effect to the change of frequency under the scheme in the Govan section of the undertaking, made up as follows:—Power station requirements, £15,460; sub-station requirements, £84,042; consumers' sub-station requirements, £135,770; mains department requirements, £18,847; consumers' department requirements, £19,184; laboratory and meter testing department, £500; estimated increased demands of existing consumers' installations and the demand from new consumers' installations, £11,659; total, £285,462. The sub-committee has approved the statement, and instructed the Town Clerk to submit it to the Central Electricity Board and to request the Board to advance free of interest from time to time such sums as may be necessary to carry out the scheme. It is stated that the total cost of changing the Corporation's electricity supply to the standard frequency of 50 cycles under the Central Scotland Electricity Scheme will be about £1,250,000.

DESTRUCTOR PLANT.—Messrs. Heenan & Froude, Ltd., have informed the Corporation that the new destructor works at Govan will be sufficiently far advanced to permit of an official opening during the first week in April, and that the works can be placed into commercial operation shortly afterwards.

Hull.—ASSISTED WIRING SCHEME.—The borough electrical engineer has prepared a scheme of assisted wiring, the initial cost being estimated at £25,000. The Electricity Committee has decided to consider the scheme at its next meeting.

Lichfield.—LOAN.—The Town Council has applied for sanction to a further loan of £23,395 for electricity purposes.

London.—ST. PANCRAS.—The Borough Council Electricity Committee has recommended the purchase of two 1,000-kW motor convertors for Tavistock Place sub-station and one 1,500-kW convertor for Regent's Park sub-station, with switchgear, at an estimated cost of £19,150.

STOKE NEWINGTON.—The Borough Council has received sanction to a loan of £5,000 for electricity meters.

FULHAM.—The Electricity and Lighting Committee has recommended the Borough Council to approve the following schemes for the supply of electricity for domestic purposes, as from April 1st next:—(1) A domestic lighting rental scheme, the hire charge for an installation up to and including 5 points being 10d. per point per quarter, and for 6 points and upwards, 9d. per point, the charge for electricity consumed to be at the ordinary lighting rate. (2) A domestic apparatus rental scheme, the charge per quarter, or per annum, varying according to the class of appliance installed, and the "unit" charge to be at the ordinary flat rate for power, with a minimum charge as for 150 kWh per quarter. (3) A combined domestic lighting, heating and cooking scheme, the charge for electricity to be the ordinary flat rate for power, with an additional charge of 1s. per quarter for each lighting point installed, plus rental charges for lighting installations and domestic apparatus, with a minimum charge as for 150 kWh per quarter.

Louth.—ELECTRICITY AGREEMENT.—In connection with the Town Council's decision to take a supply of electricity in bulk from Grimsby Corporation, the charge is to be as follows:—A first charge of £300 per annum during the continuance of the scheme, except during the first two years of the agreement, when no first charge is to be made. The first charge is to be reduced by £1 per annum for every kVA by

which the maximum demand exceeds 75 kVA, and a charge of .33d. per kWh supplied will be made. The agreement is to be for a period of 25 years, with provision for the revision of the charge for electricity every five years.

Manchester.—DOMESTIC APPLIANCES.—We regret to find that an error occurred in our issue of December 16th (p. 1039). We gave the number of cookers installed in 1924 as 2,771, and in 1925 as 678. The correct figure for 1924 is 277, from which figure there was an advance to 678 in 1925. The total installed at March 31st, 1927, was 3,029, and the estimated cumulative total at March, 1928, 4,600. The actual number of hired cookers on circuit at the end of October was 3,809, the connections for the month being 132. The electric cooker scheme has been so popular that capital outlays thereon are now too heavy to be financed out of profits. Provision was made in the Electricity Department's current annual estimates for financing such outlays up to March, 1928, and it is proposed that the borrowing powers in this connection shall not be used before next April.

Newport (Mon.).—ELECTRICITY CONTRACT.—According to the *Western Mail*, after protracted negotiations, the Electricity Committee has decided to recommend the Corporation to supply electricity to the British Mannesmann Tube Company's Newport works on the same terms and conditions as the Swansea Corporation, which affords a supply to the works of the company at Landore. The point which has given rise to the prolonged delay in completing the execution of the contract was in respect of a difference of opinion with regard to the interpretation of the coal clause. The company maintained that in agreeing to the Swansea terms the Corporation would accept the Swansea basis figure of 19s. 9d. to 18s. 6d. per ton of coal. The Corporation, however, contended that it was entitled to some lower figure on account of the difference of calorific values, and proposed 17s. 5d. to 16s. 3½d. per ton. This represented £120 per million kWh supplied. The electrical engineer states that under adverse trade conditions the company's consumption has been between 4,000,000 and 5,000,000 kWh per annum, and that it estimated that the future consumption would considerably exceed 6,000,000 and ultimately reach 10,000,000 kWh per annum. A consumption of 6,000,000 kWh per annum was equal to 75 per cent. of the total sales of the undertaking for private and public lighting traction and all domestic supplies.

Northern Ireland.—ROSTREVOR (CO. DOWN).—An electricity supply for the district was recently formally inaugurated. The cost of the plant was £3,500.

Plympton.—ELECTRICITY SUPPLY.—It was announced on December 22nd that the Ministry of Transport, following the inquiry held on October 27th, had intimated its intention of granting the application of the Rural District Council for compulsory way-leaves in respect of an overhead distribution system embracing the whole of the main roads covered by the Council's electricity scheme. Opposition was raised to this proposal at the inquiry by the Devon County Council. The Electricity Commissioners have issued sanctions to the necessary loans for the purpose of developing the remainder of the Council's scheme. The Clerk to the Council has been instructed to oppose, on the ground that the Council is already authorised to distribute in its own area, the Bill which is being promoted in the ensuing sessions of Parliament by the Wessex Electricity Company, under which that company wishes to extend its area of supply to the counties of Cornwall, Dorset, Gloucester, Somerset, Wiltshire, and the whole of the administrative county of Devon, except the borough of Torquay, the urban district of Newton Abbot, and certain parishes in the rural districts of Newton Abbot and Totnes.

Portsmouth.—WATERWORKS SUPPLY.—Following an application by the Portsmouth Waterworks Company for reconsideration of the present charge of 1d. per kWh for electrical energy supplied to the Farlington Waterworks, where additional pumping plant is to be installed, the Corporation has agreed to supply the company and other consumers agreeing to take electricity under an arrangement of restricted hours at 1d. per kWh up to 5,900 kWh per quarter, and ½d. per kWh for all electricity in excess of 5,000 kWh.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

SHOREDITCH.—Lighting and power: A reduction of 10 per cent.

LEIGH (LANCS.).—A reduction of 5 per cent.

TORQUAY.—Public lighting: A reduction of 10 per cent.

HORNSEY.—Lighting: From 5d. to 4½d. per kWh.

FULHAM.—Private lighting: Ordinary meters from 4½d. to 4d. per kWh; slot meters, from 4½d. to 4½d. per kWh. Public lighting: From 1½d. to 1d. per kWh. Power: From 1½d. to 1d. per kWh.

TYNEMOUTH.—Lighting: Flat rate, from 5½d. to 5d. per kWh.

Salford.—ELECTRICITY CHARGE.—The Corporation Electricity Committee has fixed a charge of ¾d. per kWh for electricity supplied to electric baking ovens for night baking.

Shipley.—LOAN SANCTIONED.—The Urban District Council Electricity Committee has received sanction to the borrowing of £3,600 for the purchase of domestic electrical apparatus.

Southampton.—MAINS EXTENSIONS.—The Town Council has decided to extend the mains to Netley and Hamble, to include the Royal Victoria Hospital at Netley, at a cost of £13,960.

Special Orders.—Application has been made to the Electricity Commissioners for Special Orders by the Tisbury Electric Supply Co., Ltd., authorising it to supply electricity in part of the rural district of Tisbury, and the Electrical Distribution of Yorkshire, Ltd., to supply electricity to certain parishes in the rural district of Worksop.

The Commissioners have submitted to the Minister of Transport for confirmation Special Orders made by them authorising Mr. R. F. Winder to supply electricity in the rural district of Thirsk, and part of the rural district of Great Ouseburn, and the Northallerton Electric Light and Power Co., Ltd., to supply in the urban district and part of the rural district of Northallerton.

Stoke-on-Trent.—MAINS EXTENSIONS.—The Corporation Electricity Committee has authorised mains extensions, at a cost of £3,100.

CONSULTING ENGINEER.—The Committee has retained Mr. Arthur Ellis to act as consulting engineer in the negotiations with the Electricity Commissioners and the Central Board regarding the Central England scheme.

ELECTRICITY SUPPLY.—Arrangements have been made for the supply of electricity to the works of Messrs. Robert Hyde and Son, Ltd., in the L.M.S. locomotive works at Fenton, and for this purpose the Committee is acquiring a site for a sub-station.

ELECTRICITY IN BULK.—The electrical engineer has reported to the Committee upon his interview with Mr. J. N. R. Perks, of the Power Development Co., Ltd., regarding a supply in bulk to that company in the Cheadle district, and the Committee has amended the terms to £4 per kW per annum and ¼d. per kWh, provided the power factor be not less than .8.

Tramway and Railway Notes.

Blackburn.—FARES.—After an experimental term, the Corporation Tramways Committee has decided to discontinue penny fares on account of the loss entailed thereby, and to revise existing charges. Return tickets will be issued on certain extended sections for 3d., with 2d. for the single journey, as compared with the present charge of 1½d. each way.

Bradford.—FARES.—According to the *Electric Railway and Tramway Journal*, in view of a proposal to restore the old 1½d. tramway stages a report has been prepared by the city treasurer and the tramway manager showing the effect which the adoption of such a resolution would have on the finances of the Department. It would mean, states the report, that 34,000,000 passengers would each pay ½d. less, equal to about £71,000 in a year. The continued operation of the existing fares until the end of the present financial year is held as being justified by the results obtained since the fares were revised. There was an increase of £11,000 in the revenue for the six months ended September 30th, instead of a heavy loss, the number of passengers having increased by 3,564,012. The report also states that to cope with increasing competition, considerable sums are being spent in speeding up and increasing travel comfort, and that it would be unwise "to restrict our source of income at this critical period in the history of the city's passenger transport." An extension of the influence of the weekly pass to make it applicable to the old 3d. stage from the centre of the city is the only increased facility which the report can recommend. The proposal to inaugurate 1½d. fares was defeated at the Council meeting by 40 votes to 34.

Continental.—ITALY.—An electric railway is to be constructed between Rimini and San Marino.

SWITZERLAND.—Electric trains commenced running on December 23rd on the newly electrified section of the Swiss Federal Railway between Yverdon, Neuenburg, Biel, Solothurn, and Olten.

Glasgow.—NEW PLANT.—The Corporation Tramways Committee, on December 21st, considered the question of the installation of plant at the Pinkston power station, and recommended that the manager's proposals for the installation of new plant at a cost of £237,500 be approved. It was also proposed that the Town Clerk be instructed to make application to the Electricity Commissioners for their consent to the scheme, and that the manager be instructed to invite offers for the following:—One 18,750-kW turbo-alternator; six new boilers of 50,000-lb. steam capacity per hour; h.p. switchgear and necessary alterations to buildings; additional rotary convertors in Dalhousie, Coplawhill, Partick, and Bellahouston sub-stations.

NEW CARS.—According to the *Financial News*, the Glasgow Corporation has decided to purchase 50 tramcars of the most modern type, and also to recondition 150 existing cars to the same up-to-date standard. Twenty-five motor-'buses will also be ordered, and the entire scheme is expected to entail an expenditure of £100,000.

Telegraph and Telephone Notes.

Austria.—AUSTRO-TURKISH WIRELESS LINK.—The Austrian Radio Company, on December 21st, inaugurated the new wireless-telegraph service between Vienna and Constantinople. —*Reuter* (Vienna).

Belgium.—TELEPHONE SERVICE.—During the last five years the number of telephone subscribers has increased from 73,800 to a total of 147,000.

Palestine.—TELEGRAPH SERVICE.—There are thirty-two telegraph offices in Palestine, says the *T. & T. Age*. The length of telegraph wire on January 1st, 1926, was 1,429 miles; during 1925, a total of 307,165 messages were sent, and the gross revenue for that year was $143,515. The investment in the telegraph plant is given as $117,755.

Sweden. — TELEGRAPH AND TELEPHONE SERVICES. — The Swedish Government Telegraph and Telephone Department estimates this year's revenue at 86,360,000 kronor, which means an increase of 4 per cent. compared with the previous year. The surplus of income over expenses will amount to 19,100,000 kronor, thus representing an interest of 6.3 per cent. on the capital invested, which amounts to 310,000,000 kronor.

Transatlantic Telephony.—U.S.A. LOSSES.—The recent statement in the House of Commons with regard to the losses incurred by the British Post Office on the transatlantic telephone service was read with much interest in New York. The American Telephone and Telegraph Company has also found the service not a paying proposition, but has announced that the service will be continued in spite of the fact that the loss incurred by it is relatively larger than that sustained by the G.P.O.—*Reuter* (New York).

PORTUGAL.—Experts have arrived at Lisbon to arrange for the linking-up by radio-telephony of Madrid and Lisbon with North America, *via* London.—*Reuter* (Lisbon).

U.S.A.—TELEPHONE-LINE POLES.—The modern American city has almost forgotten what a telephone pole looks like. More than 67 per cent. of the telephone wires in the Bell system are in underground cables, yet there are still over 38,000,000 poles in the United States; thirty million miles of wire are now in underground conduit, representing an investment of $500,000,000. A 1,200-pair cable of No. 24 gauge, containing 2,424 wires, can be installed for about $13 per mile of circuit.

Radio Notes.

Atmospherics. — INVESTIGATION COMMITTEE. — The Royal Meteorological Society is to be congratulated on having appointed a committee of experts to investigate the problem of atmospherics, more especially with reference to forecasting the weather. The popular theory that they are the result of electrical disturbance caused by thunderstorms seems to be open to doubt, and it may be that the real origin of certain atmospherics is as yet utterly unsuspected. The investigation is to continue.

Denmark.—UNAUTHORISED STATION.—While Prof. William Rung, of the Polytechnic Academy, Copenhagen, was seeking with his wireless set at night to tune in the Copenhagen broadcasting station, he unexpectedly heard an unknown station with a wave-length evidently near 350 metres, and heard a lecture in Danish, giving the impression of being well-considered Bolshevic propaganda. The Danish Government's Radio Council has started a search for the station, which is believed to be either on the Baltic coast or on board a vessel.

Germany.—WOODEN AERIAL MASTS.—Stations under construction and those projected are to be fitted with wooden aerial masts instead of the usual steel ones, says *World-Radio*, as a result of the Munich station's success with this type of aerial support. The previous aerial system radiated only about 20 per cent. of the energy fed into it. When the steel masts were replaced by wooden ones, by way of less height, the percentage rose to 63 per cent.

NEW STATION.—What is described as the most powerful station in Western Europe, was opened on December 20th by the Minister of Posts. It is at Zeesen, 20 miles south of Berlin, and will be used in place of the present Königswüsterhausen. Its transmitting power is 40 kilowatts, and its wave-length 1,250 metres. The aerial is carried by two 700-ft. high steel masts.

Russia.—NEW RADIO CRYSTAL.—Crystals for wireless sets are now all imported into the Soviet Union. The radio-technical laboratory of the Institute of Applied Mineralogy and Metallurgy, after many experiments, has invented a crystal approaching imported crystals in effectiveness. The experiments are being continued, and the laboratory hopes to be able ultimately to produce a crystal that will do away with the necessity for importations.—*Reuter's Trade Service* (Moscow).

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—BUENOS AIRES.—January 17th. National Sanitation Works Department. Three 350-kW Pelton-type turbines and 6,600-V, three-phase generators. Two 20-kVA, 3-phase static transformers, one distribution switchboard and connections. (B.X. 3921.)*

Australia.—SYDNEY.—February 1st. New South Wales Government Railways. One 3,000-kW rotary-convertor unit for Hornsby sub-station, and one ditto for St. Leonards sub-station. Chief Electrical Engineer, 61, Hunter Street, Sydney.

MELBOURNE.—February 22nd. Victorian Railways. Electric butt-welding machine. (B.X. 4095.)*

March 7th. City Council. D.c. switchgear and accessories. (B.X. 4100.)* 6,600-V switchgear. (B.X. 4101.)*

MELBOURNE.—P.M.G.'s Department. February 21st. Bells and buzzers. (B.X. 4084.)*

February 28th. Condensers. (B.X. 4089.)* Test desks for auto exchanges. (B.X. 4090.)*

Birmingham.—January 9th. Tramways and Omnibus Committee. Supply and delivery of 50 new tramcar bodies. Form of tender from Mr. A. Baker, general manager, Tramway Offices, Council House, Congreve Street.

January 10th. Electric Supply Department. Three 2,000-kW rotary-convertor equipments; two 1,000-kW ditto and two 750-kW ditto. (December 16th.)

Chile.—SANTIAGO.—March 7th. Ports Commission. Five electric travelling portal cranes for Punta Arenas. (A.X. 5648.)*

Darfield.—January 17th. Education Committee. Installation of electric light at Darfield New Infants' School. Particulars from the Education Department, the County Hall, Wakefield.

India.—January 13th. India Stores Department. Two water-tube boilers, stokers, and condensing plant; two 300-kW high-speed vertical steam generator sets and condensing plant; one h.p. cubicle switchboard and one l.p. a.c. ditto; two 200-kVA transformers. Forms of tender from India Stores Department, Belvedere Road, S.E.1.

Leicester.—January 21st. Electricity Department. Buildings, coal- and ash-handling plant, railway sidings, &c., three water-tube boilers complete, one 25,000-kW and one 1,500-kW turbo-alternators with condensing plant and accessories, and three ferro-concrete cooling towers. (December 2nd.)

London.—ISLINGTON.—January 20th. Electricity Department. 12 months' supply of cables, meters, transformers, lamps, wires, &c. (December 16th.)

H.M. OFFICE OF WORKS.—January 5th. Rewiring work (in steel conduit) at the Ministry of Pensions Hospital, Orpington, Kent. Contract Branch, King Charles Street, S.W.1.

MINISTRY OF LABOUR.—January 12th. Crude oil engine-generator set, booster set and panels for the Meeting Hall, Brandon, Norfolk. (See this issue.)

CAMBERWELL.—January 16th. Borough Council. Twelve months' supply of electric lamps and maintenance of electric lighting, heating and power installations, telephones, &c. Forms of tender from Mr. W. Bell, borough engineer and surveyor, Town Hall, Camberwell, S.E.

Lourenco Marques.—February 13th. Ports and Railways. Two 350-h.p. electric motors. (B.X. 3996.)*

Manchester. — January 3rd. Electricity Committee. Low-pressure auxiliary pipework. (December 9th.)

New Zealand.—WELLINGTON.—Public Works Department. February 18th. Storage battery and motor for Arapuni. (B.X. 4032.)*
April 21st. New Zealand Government Railways. Machine tools and workshop equipment. (A.X. 5647.)*
January 25th. Post and Telegraph Department. Telephone switchboard plugs. (B.X. 4073.)*
April 17th. Sub-station protectors. (B.X. 4074.)*
TE AROHA.—January 17th. Thames Valley Electric Power Board. Thirty 11,000/415-V transformers. (B.X. 4075.)*
CHRISTCHURCH.—March 13th. Drainage Board. Nine electric centrifugal sewage pumping plants. (A.X. 5457.)*

South Africa.—WORCESTER, C.P.—February 1st. Municipal Council. Generating plant, consisting of water-tube boiler, automatic stoker, chimney and induced draught plant, steam piping, &c. (A.X. 5675.)*
CAPE TOWN.—January 18th. Electricity Department. Disconnecting boxes. (B.X. 4088.)*

Stafford.—December 31st. Education Committee. Installation of electric lighting and power in the Friary School, Lichfield. (December 9th.)

Swindon.—January 14th. Electricity Department. 6,600-V and 3,300-V a.c. and 440-V d.c. switchgear. (December 16th.)

Turkey.—ANGORA.—December 31st. Administration Générale des Chemins de fer de l'Etat. Machine tools, pumps, motors, &c., for the railway workshops at Eski-Chéhir. (A.X. 5683.)*

Uruguay.—MONTEVIDEO.—January 21st. State Electricity Works. Overhead sub-stations and switching towers. (B.X. 4028.)*
February 1st. 153,000 metres of galvanised flexible steel cable for guard wire. (A.X. 5654.)*
February 2nd. Installation of a telephone system between various localities. (B.X. 4082.)*
February 5th. Ministry of Public Works. 22 cranes for the Hydrographic Department. (A.X. 5478.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—MELBOURNE.—Commonwealth P.M.G.'s Department. Automatic telephone exchange equipment for Coorparoo, Brisbane :—
Exchange equipment (£3,750), junction equipment (£304).—Siemens (Aust.) Pty., Ltd.
State Electricity Commission of Victoria.
Lead-covered armoured cable (Spec. 27/77) (£5,087).—Johnson & Phillips, Ltd.
70,000-V transformers and spares (Spec. 27/90) (£1,003).—Weymouths, Ltd.
SYDNEY.—New South Wales Railways.
2,200-V insulated cable (£3,789).—Enfield Cable Works (Aust.), Ltd.
Sixty-five 2-kVA and five 10-kVA transformers (£1,076).—Standard Waygood, Ltd.
PERTH.—Western Australian Government Tramways.
3,000 yd. 660-V armoured cable, boxes and jointing materials (£1,333).—Enfield Cable Works (Aust.), Ltd.
—*Tenders.*

China.—SHANGHAI.—In a *Reuter* dispatch quoted on p. 1087 of our last issue mention was made of a contract (£150,000), placed with the Skoda Works, for material for the central electricity station. We should explain that this does not relate to the Shanghai Municipal Council's system of which Mr. T. H. U. Aldridge is chief engineer and manager. It probably refers to one of the other undertakings which distributes outside the International Settlement boundary. The Shanghai Municipal Council's undertaking is an international one, but the organisation is on British lines and the bulk of the plant, both generating and distributing, is British also. Indeed, last year the Council ordered one 20,000-kW turbo-generator and condenser from the Metropolitan-Vickers Co., three boilers from Babcock & Wilcox, pulverised coal equipment from International Combustion, Ltd., and main switchgear from the B.T.-H. Co. Recently further equipment has been ordered from all of these companies, a pump from W. H. Allen, Sons and Co., and large orders for underground cable, meters, &c., are in hand for ordinary yearly requirements.

Dublin.—County Borough Commissioners. Accepted :—
Six arc lamp pillars (£154).—Hammond Lane Foundry Co., Ltd.
Electricity meters for 12 months.—Dr. Paul Meyer A.G.; Landis & Gyr, Ltd.; Aronwerke Elektricitäts Gesellschaft; and Metropolitan-Vickers Electrical Co., Ltd.
Time switches for 12 months.—Drake & Gorham Wholesale, Ltd.
Arc lamp carbons.—Roper Bros.
—*Irish Builder and Engineer.*

Dundee.—The Electricity Committee at the last meeting accepted offers for cables of Belgian and German origin at a total cost of £1,921. The nearest British offer was £2,432.

Glasgow.—Corporation Housing Committee. Recommended :—
Electrical installation at Parkhead rehousing scheme (£473).—R. J. Sinclair (Glasgow), Ltd.
Cleansing Committee. Recommended :—
One 500-kVA transformer, cables, feeder panels, &c., for the garage at the new destructor works (£3,359).—Heenan & Froude.
Outside lighting installation (£595).—H. D. Boothroyd and Co.
Electricity Sub-Committee on Propaganda. Recommended :—
500 electric cookers (small size) (£5,875).—Siemens Electric Lamps & Supplies, Ltd.
50 electric cookers (large size) (£775).—Falkirk Iron Co., Ltd.
Tramway Committee. Recommended :—
Special work.—Edgar Allen & Co., Ltd.
D.C.C. wire.—London Electric Wire Company and Smith's, Ltd.
Armature coils.—Manchester Armature Repair Co., Ltd.
Pinions.—W. C. Yuille & Co., Ltd., and British Hele-Shaw Patent Clutch Co., Ltd.
Improvements Committee. Recommended :—
Electrical installation at Glasgow Cross buildings (£1,311).—Kennedy, Robertson & Bain.

Government Contracts.—The following contracts were placed by various Government departments during November :

ADMIRALTY, CONTRACT AND PURCHASE DEPARTMENT.
Motor alternators.—Newton Bros. (Derby), Ltd.
Cable and cable boxes.—G. E. Taylor & Co.
Cells.—Fuller Accumulator Co., Ltd.
Motor generators.—Mackie & Co., Ltd.; Bulpitt & Sons, Ltd.; Newton Bros. (Derby), Ltd.
Moving coil indicators.—Evershed & Vignoles, Ltd.
Note magnifiers.—Plessy Co., Ltd.
Motor and switchgear.—English Electric Co., Ltd.
Regulators, starters, &c.—Whipp & Bourne, Ltd.; E. N. Bray, Ltd.
Switchboards and switchgear.—Park Royal Engineering Co., Ltd.; Parmiter, Hope & Sugden, Ltd.
Switchgear and static transformers.—English Electric Co., Ltd.
Electric lamps.—Metro-Vick Supplies, Ltd.

WAR OFFICE.
Distribution boards.—Cable Accessories Co., Ltd.
Conduits and fittings.—Stella Conduits Co., Ltd.
Charging generators.—G. Kent, Ltd.
Switchboards.—Park Royal Engineering Co., Ltd.

AIR MINISTRY.
D.f. connectors.—Siemens Bros. & Co., Ltd.
Reed reaction apparatus.—Reed Mfg. & Construction Co., Ltd.

POST OFFICE.
Manufacture, supply, drawing in and jointing cable.—Kensington-Battersea Junc., Kensington-Putney Junc., Kensington-Shepherd's Bush, Mechanical Tandem-Speedwell.—Johnson & Phillips, Ltd. Mechanical Tandem-Archway Junc.—Callender's Cable & Construction Co., Ltd. Mechanical Tandem-Paddington Junc.—Standard Telephones & Cables, Ltd. Leeds-Bradford.—British Insulated Cables, Ltd.
Electric lighting installations.—Metropolitan Automatic Telephone Exchange and Kensington New Automatic Exchange.—Electrical Installations, Ltd.
Installing new lift and extending new lift (G.P.O. West).—W. Wadsworth & Sons, Ltd.
Telephone exchange equipment.—Norbury (relief): Siemens Bros. & Co., Ltd. Sub-contractors: English Electric Co., Ltd., for charging machines; Crompton-Parkinson, Ltd., for ringing machines; Pritchett and Gold & E.P.S., Ltd., for batteries. Sowerby Bridge and Hepperholme (Halifax multi-exchange area): Standard Telephones & Cables, Ltd. Sub-contractors: Walter Jones & Co., for ringing machines. Emberbrook (Ditton): Standard Telephones & Cables, Ltd. Sub-contractors: Crompton-Parkinson, Ltd., for machines; Premier Accumulator Co. (1921), Ltd., for batteries. Halifax and Wavertree (Liverpool): Standard Telephones & Cables, Ltd. Shepherd's Bush: Ericsson Telephones, Ltd. Sub-contractors: Crompton-Parkinson, Ltd., for machines; D.P. Battery Co., Ltd., for batteries. Rochdale Corporation: Relay Automatic Telephone Co., Ltd.

Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Ericsson Telephones, Ltd.; Peel-Conner Telephone Works (General Electric Co., Ltd.); Phœnix Telephone & Electric Works, Ltd.; Plessey Co., Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.; Sterling Telephone & Electric Co., Ltd.; Telephone Mfg. Co., Ltd.
Protective apparatus.—Standard Telephones & Cables, Ltd.
Terminal blocks.—T. De la Rue & Co., Ltd.
Cable (various).—Connollys (Blackley), Ltd.; General Electric Co., Ltd. (Peel-Conner Telephone Works); W. T. Glover & Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.
Loading coils.—General Electric Co., Ltd.
Compound.—Dussek Bros. & Co., Ltd.
Cords for telephones.—L.P.S. Electrical Co., Ltd.; Phœnix Telephone & Electric Works, Ltd.; Reliance Electrical Wire Co.; Siemens Bros. & Co., Ltd.; Standard Telephones & Cables, Ltd.
Fibre ducts.—Key Engineering Co., Ltd.
Telegraphic ironwork.—Guest, Keen & Nettlefold, Ltd.
Electric lamps.—A. C. Cossor, Ltd.; Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.
Tungar rectifiers.—British Thomson-Houston Co., Ltd.
Wire.—W. T. Henley's Telegraph Works Co., Ltd.

CROWN AGENTS FOR THE COLONIES.

Battery materials.—India Rubber, Gutta Percha & Telegraph Works Co., Ltd.
Cables.—Callender's Cable & Construction Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Standard Telephones & Cables, Ltd.
Electrical materials.—Metropolitan-Vickers Electrical Export Co., Ltd.
Electric battery.—Tudor Accumulator Co., Ltd.
Lux cells.—Chloride Electrical Storage Co., Ltd.
Overhead line materials.—Bullers, Ltd.
Telegraph materials.—Automatic Telephone Mfg. Co., Ltd.
Telephone materials.—Siemens Bros. & Co., Ltd.
Telephone switchboards.—Peel-Conner Telephone Works.
Transformers.—Ferranti, Ltd.

Hertford and Ware.—Joint Hospital Board. Accepted:—Wiring the administrative block at the Isolation hospital, including laying the cable (£107).—North Metropolitan Electric Power Supply Company.

Lamp Contracts.—Siemens Electric Lamp and Supplies, Ltd., has received a contract from the Admiralty for traction gasfilled and vacuum lamps. The London and North-Eastern Railway Co. has placed a contract for "Mazda" lamps with the British Thomson-Houston Co., Ltd.

London.—STOKE NEWINGTON.—Electricity Committee. Accepted:—
Twelve months' supply of 4-core distributor cables.—W. T. Henley's Telegraph Works Co., Ltd.
POPLAR.—Electricity Committee. Recommended:—
Plant for the supply of electricity to Messrs. T. W. French (recommended) one 3-cubicle high-pressure switchboard, two transformers and erection, &c. (£980).—General Electric Co., Ltd.
SOUTHWARK.—Electricity Committee. Recommended:—
Two feeder pillars (£107).—W. Lucy & Co., Ltd.
Cable.—Hackbridge Cable Co., Ltd.
ST. PANCRAS.—Housing Committee. Recommended:—
Wiring and fitting East End dwellings (£315).—City Electrical Co.
STEPNEY.—Electricity Supply Committee. Accepted:—
50 cast-iron chambers, frames and covers (£87).—J. Warner, Ltd.
2,000 tons best washed peas (16s. 9d. per ton).—E. Foster and Co.

Pershore.—Board of Guardians. Accepted:—
Installing electric light at the institute and cottage homes.—Booth & Bomford.

Southend-on-Sea.—Town Council. Accepted:—
Electric meters (£3,260).—Chamberlain & Hookham, Ltd.

Spenborough.—Education Committee. Accepted:—
Installing electric light at new schools at South Parade.—Butler & Horn (Cleckheaton).

Stoke-on-Trent.—Housing Committee. Accepted:—
Electric lighting installation at 44 houses, Water Street Housing Estate (£242).—D. E. Foster-Thornton.

Swansea.—Electricity Committee. Accepted:—
Renewal of contract for the maintenance of the Amman Valley main transmission line at £45 per mile for a further 12 months.—Callender's Cable & Construction Co., Ltd.

Tynemouth.—Electricity Committee. Accepted:—
Switch panel (£125).—English Electric Co., Ltd.

Worcester.—Board of Guardians. Accepted:—
Installing electric light at a new Nurses' Home (£129).—J. Ward, Ltd.

Forthcoming Events.

Electrical Power Engineers' Association (Southern Division).—Friday, December 30th. Institution of Electrical Engineers, London, W.C. 7 p.m. Exhibition of a film, "The Babcock & Wilcox Boiler." Described by Mr. J. K. Muir.

Royal Institution of Great Britain.—Juvenile Christmas Lectures. December 31st, January 3rd, January 5th. 31, Albemarle Street, S.W. 3 p.m. "Engines." Dr. E. N. da C. Andrade.

Association of Supervising Electrical Engineers.—Tuesday, January 3rd. Junior Institution of Engineers, 39, Victoria Street, S.W. 7.15 p.m. "Maintenance Works." Messrs. E. L. Eastell and B. C. Garman.

Institution of Electrical Engineers.—Thursday, January 5th. Institution, London, W.C. 6 p.m. "Storage Batteries in Relation to Modern Supply of Electric Lighting and Power." Mr. E. C. McKinnon.

(Wireless Section).—Wednesday, January 4th. Institution, London, W.C. 6 p.m. "Rotating Loop Radio Transmitters and their Application to Direction-finding and Navigation." Mr. T. H. Gill and Mr. N. F. S. Hecht. "Some Experiments on the Application of the Rotating Beacon Transmitter to Marine Navigation." Dr. R. L. Smith-Rose and Mr. S. R. Chapman. "A Theoretical Discussion of Various Possible Aerial Arrangements for Rotating Beacon Transmitters." Dr. R. L. Smith-Rose.

Institution of Mechanical Engineers.—Thursday, January 5th. Storey's Gate, S.W. 6 p.m. Thomas Lowe Gray Lecture, "The Marine Oil Engine." Prof. C. J. Hawkes.

Junior Institution of Engineers.—Friday, January 6th. 39, Victoria Street, S.W. 6 p.m. Exhibition of Instruments and Scientific Appliances.

Notes.

Heating Rivets by Electricity.

The British Electrical Development Association, Inc., has issued a pamphlet under the above title in which some interesting figures as to the cost of heating rivets electrically are given. A three-head riveter, which can be used at one-third, two-thirds, or full output, will, when working at full rating, deliver heated rivets as follows:—$\frac{3}{4}$-in. rivet, with 2$\frac{1}{2}$-in. shank, 300 rivets heated per hour; $\frac{7}{8}$-in. rivet with 3$\frac{1}{4}$-in. shank, 225 per hour; 1-in. rivet with 3$\frac{3}{4}$-in. shank, 180 per hour. These rates can be obtained continuously with the rivets heated evenly throughout. If it is sufficient for the tail of the rivet to be well heated and the head only dull red, the above outputs can be increased by about 15 per cent. The consumption of electricity varies from 1 kWh per 5$\frac{1}{2}$ lb. of rivets to the same figure for 10 lb. of rivets, according to the size of the rivets.

The Electric Girdle.

Under the above title the North Metropolitan Electric Power Supply Co. has issued a 53-page book in which the activities of the company are outlined and the "story" of electricity and its uses to mankind is told in a popular manner. The work is well prepared and illustrated. The two main generating stations, Willesden and Brimsdown, have at present capacities of 25,500 and 23,600 kW, respectively. The new Brimsdown station is planned to accommodate 50,000 kW of generating plant. The supply area is 632 sq. miles, which is served by 208 sub-stations and 1,150 miles of mains. The company has connected a total of 69,000 consumers.

The "Min-rip" Dynamo.

Mr. W. Brooks Sayers, continuing his work on novel types of generators and motors, informs us that he has developed a machine in which the separate commutator is eliminated, and iron plates are used "in the triple capacity of conveyors of magnetic flux, as electric conductors, and as commutation elements"; the degree of subdivision is three or more times greater than is possible with toothed armatures, and the amplitude and intensity of ripple is correspondingly diminished.

Timber Works Electrification.

With reference to the electrical installation at the works of Messrs. Bell & Sime, Ltd., Dundee, mentioned in our last issue (p. 1075), we are informed that the 300-kW alternator coupled to Messrs. Carmichael's turbine, and 27 motors installed in the works were made by the Harland Engineering Co., Ltd., London.

The Whitworth Society

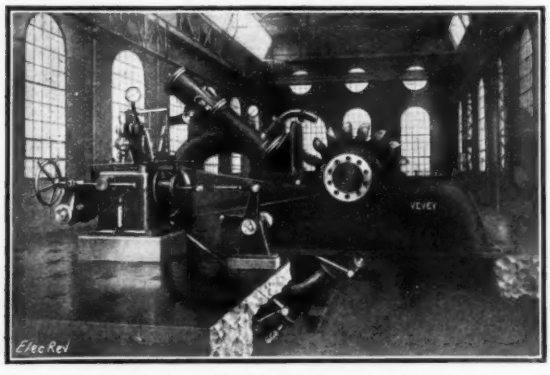
The fifth annual commemoration dinner of the above Society was held on December 21st, this being the anniversary of the birth of Sir Joseph Whitworth. The chair was taken by the president, Mr. Thomas Sugden, M.Inst.C.E., and 66 members were present. Interesting notes upon the life of Sir Joseph Whitworth, with photographs, were given by Mr. W. Price Abell, and the death of Mr. R. B. Buckley, a past president, was announced.

Indian Wireless Research.

The report of the Indian Institute of Science, Mysore, shows that one of the subjects of active research at the Institute during the past year was that of wireless telegraphy, the investigations being conducted under the direction of Prof. J. K. Catterson Smith. Continuous measurement of radio-signal strength has been made and new apparatus is under construction for extending the scope of three experiments as part of a general study of wireless transmitters; portable apparatus for measuring the modulation of radiation from a telephone transmitter has been constructed, short-wave circuits have been examined, and experiments on the damping of shock-excited radio circuits have been conducted. Anti-atmospheric properties displayed by a combination of frame-coil receivers have been investigated and distortion in audio-frequency transformers has been analysed by the cathode-ray oscillograph.

The Peuffaire Power Development.

The following notes concerning the Peuffaire hydro-electric undertaking have been received from our Swiss correspondent. Peuffaire uses the waters of the two Avançons above Bex, forming a most useful adjunct to the Jura yield, the Peuffaire being at its highest when the Montcherand and Dernier works are at their lowest. Though the Avançon only yields 450 litres per second (and sometimes only 250) in winter, its summer output averages 4,500 litres per second. The waterworks are at a height of 1,140 metres, where is the reservoir of the Béroud containing 10,000 cu. m. The fall is actually 390 m., and five turbines, one of 8,000 h.p., and four of 5,000 h.p. running at 750 r.p.m., are called upon to supply an



Water Turbine in Makers' Works.

average load of 18,000 h.p. The electricity is generated at a pressure of 5,000 V, which is raised for transmission to 60,000 V. It is hoped that it will be eventually raised to 120,000 volts. The accompanying illustration shows one of the new turbines in the works of the Ateliers de Constructions Mécaniques, of Vevey, the firm responsible for its construction, and by whose courtesy the photograph is reproduced.

Neon Lamp Service Specification.

The Wireless Telegraphy Board has issued specification No. K201 for Neon Lamps (H.M. Stationery Office, price 2d. net) which has been prepared to meet the requirements common to the Royal Navy, Army, and Air Force. It covers technical requirements and tests, such matters as packing, marking, delivery, &c., which are not common to the services, not being specified. *Inter alia*, the current passed through the lamp as soon as the striking voltage causes a visible discharge must not exceed 4 mA under any condition; the capacity when measured at a frequency of 2,000,000 cycles per second must be between 2.5 and 3 micro-microfarads, and a life of 2,000 working hours is expected. The lamp is intended to be suitable for use as a high-frequency voltage indicator in wavemeters.

Institute of Wireless Technology.

A meeting of the Institute will take place on Tuesday, January 3rd, at 7 p.m., at the Engineers' Club, Coventry Street, W., when Mr. E. H. Turle, M.I.E.E., M.I.R.E., will open a discussion entitled "The Relation between Anode Current Consumption and Reaction Coupling." Information respecting this and other meetings of the Institute may be obtained from the Hon. Secretary at 71, Kingsway, London, W.C.2.

Machine-Laid High-Voltage Cables.

One of the German electricity supply companies, the Weissenfels-Zeitz Electricity Association, has adopted a machine which is an invention of Mr. Schramm, manager of the Association, and has been constructed by the Weserhütte A.G., of Oeynhausen i/W, the well-known trench-dredger builders. According to the *Manchester Guardian Commercial*, the new cable dredger is designed to reduce the cost of cable laying, particularly that of the earthwork connected with it, which has hitherto been very high. It carries out all operations automatically and is made up of four parts—the dredger which digs out the trench 45 cm. wide and up to 1.3 metres deep; the conveyor, which with its rotating terminal shoot throws the excavated soil behind the trench dredger back again into the trench; the cable car drawn by the dredger which carries the cable drum and at the same time rolls in and levels the soil, which, of course, having become loosened, lies above the original level; and the feeding apparatus laying the cable into the open portion of the trench behind the dredger. The two vehicles (the dredger and cable car) are mounted on caterpillar tracks, and will pass over any kind of ground. All machines are driven by the same prime mover, a 45-h.p. Diesel engine. Only five men are required to operate the whole outfit, which, according to circumstances and the condition of the soil, will lay in position 93 metres, 80 metres, or 61 metres of cable, thus cutting down the cost of a given length of cable to about one-eighth of that of an equal length of hand-laid cable.

Memorial to Baudot.

A statue of the late M. Emile Baudot, the inventor of the telegraph transmission instrument bearing his name, was recently unveiled in the courtyard of the French General Post Office in Paris.

Roads and Cars.

Members and friends of the Paisley Association of Electrical Engineers met on December 22nd to hear a lecture on "Roads and Motor Cars," by Mr. P. A. Mossay, London, who traced the formation of roads from Roman times and the development of transport. The author favoured the railless car trolley-collecting its electric power from overhead wires, and sketched an arrangement which was being experimented with whereby electric road vehicles might be able to draw their power at high frequency from cables laid below roads. The vehicles would be fitted with transformer coils which would become energised through a space of about two feet from the road cable to the coils in the vehicle. The lecture was illustrated with lantern slides, and a discussion followed.

B.E.S.A. Publication.

The British Engineering Standards Association has recently issued a specification for the Electrical Performance of Rotary Convertors (B.S.S. No. 172-1927). This is the final one of a series of new specifications which replace B.S.S. No. 72-1917 for the Performance of Electrical Machinery, and applies to rotary convertors for industrial purposes and tramway traction of 50 kW (direct working) or 50 kVA (inverted working) and upwards, having windings insulated with Class A material (as defined in an appendix), and to the apparatus associated therewith, including directly-driven exciters and boosters, induction regulators and starting motors. It does not apply to rotary convertors for railway service. The first part of the document, as usual, contains definitions relating to the characteristics of the machines, but a new feature is introduced in the definition of the standard wave-form of d.c. voltage. Subsequent sections of the specification deal with rating limits of temperature-rise, overloads, commutation, parallel-running, efficiency and power-factor, high-voltage tests, overspeed, performance and type tests, and information to be given on rating-plate. The specification proper is followed by a series of appendices dealing with the classification of insulating materials, service conditions, temperature measurements, information to be given with inquiry and order, and methods of declaring efficiency. The recommendations of the International Electrotechnical Commission have been adopted wherever possible.

Copies of the Specification (No. 172-1927) may be obtained from the Publications Department of the British Engineering Standards Association, 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

Electro-farming Research in Sweden.

At the recent annual meeting of the Swedish Academy of Engineering Science, in Stockholm, the principal, Mr. Axel F. Enstrom, reviewing the past year's work, reported that an association for agricultural technique had been organised for research work in the utilisation of electrical energy for agricultural purposes.

The I.E.E. Benevolent Fund.

A performance of "Rosemary" will be given at the Rudolf Steiner Hall, Baker Street, London, at 8.30 p.m. on Tuesday, January 24th, in aid of the Benevolent Fund of the Institution of Electrical Engineers. The performance has been organised by Colonel Kenelm Edgcumbe, M.I.E.E. (who takes the part of "Sir Jasper Thorndyke"), supported by a strong cast of amateur players, and assisted by the Colindale Works Orchestra of Everett, Edgcumbe & Co., Ltd. The play will be produced under the direction of Mr. Cuthbert Andrews, whose association with the manufacture of X-ray equipment adds additional electrical interest to the whole effort. The I.E.E. Benevolent Fund, which was established in 1890, performs an invaluable office in assisting distressed members of the Institution and their dependants. The excellent work of the Fund calls for the united support of all electrical men; and in the performance of "Rosemary" an opportunity will be provided to assist a most deserving cause by attending a play of exceptional histrionic and electrical interest.

Tickets for "Rosemary" (7s. 6d. and 5s., both "reserved") may be obtained from active supporters of the Fund and from Mr. P. F. Rowell, secretary, Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2.

An Unusual Short-circuit.

It is reported that about 1.30 a.m. on December 20th, the inhabitants of Lobbes, near Charleroi, Belgium, were awakened by the sound of rifle shots and the ringing of the tocsin. According to the *Daily Mail*, the wires which carry electricity to houses in the middle of the town were "red hot"; people who tried to switch on their lamps burst the globes or blew the fuses; two houses were burned, the fires having been started by short circuits which were noticed by railway watchmen who gave the alarm by firing their rifles. Later, householders were instructed to switch off their supplies at the mains. Apparently a distribution line feeding part of the town made contact somehow with a transmission line from the generating station, the l.p. distributor thus being energised at an excessive voltage.

Safety Lamp Regulations.

We have received from the Secretary for Mines copies of the Coal Mines General Regulations (Safety Lamps), 1927, and the Safety Lamps (Relighting) Order, 1927, which he has made, to come into force on January 1st, 1928. The Regulations prohibit the practice (hitherto permissible) of unlocking and opening safety lamps at the appointed lamp stations in any mine or part of a mine in which safety lamps are required by law to be used. The effect of the prohibition will be that flame safety lamps generally will either have to be relighted electrically (without unlocking) at the appointed lamp stations, or they will have to be sent out of the pit or to some other place where the use of an open flame is permissible. The Regulations also define more closely than the provisions which they supersede the duties of the authorised person who is appointed to carry out the responsible work of relighting the lamps.

Appointments Vacant.

Assistant civil engineer (£500); assistant electrical and mechanical engineer (£300); assistant electrical engineer (£300); mains engineer (£600); and assistant electrical engineer (Grade 1) (£500), for the Government of Ceylon Electrical Department. Charge engineer for the St. Helens Corporation Electricity Department. Sales assistant (£274), for the City of Sheffield Electric Supply Department. Assistant meter superintendent (£383), for the Stepney Borough Council Electricity Department. Meter mechanic (75s. 3d.) and engine driver (67s. 9d.) for the Tunbridge Wells Corporation Electricity Department. (See our advertisement pages to-day.)

A Tidal Power Scheme.

The Exmouth Urban District Council has appointed Mr. Bardens as its delegate to a conference convened by the Exe Power Association with a view to exploring the possibility of co-operation between Exeter, Honiton, Axminster, Seaton, Budleigh Salterton, and other towns, with regard to the production of electricity from the tidal power of the river Exe.

London Traffic Control.

At last week's meeting of the London County Council, the Special Committee on Traffic was empowered to enter into preliminary discussions with other authorities concerned on the question of co-ordinating London's transport facilities, having due regard to the safeguarding of the interests of the Council's tramways.

E.A.W. Activities.

The programme for the second half of the winter session, 1927-1928, of the Manchester District Branch of the Electrical Association for Women, includes visits to Messrs. W. T. Glover's cable works and the City and Central Telephone Exchanges. The following lectures have also been arranged for:—"The Outlook for Smoke Abatement" (Miss Fitzgerald); "Electricity and Sunlight" (Dr. Catherine Chisholm); and "The Romance of Electricity" (Mr. A. P. M. Fleming).

A branch of the Association is to be formed in Leeds, and the inaugural meeting will be held on January 26th at the Philosophical Society's Hall.

The Physical and Optical Societies' Exhibition.

The eighteenth annual exhibition of the Physical and Optical Societies will be held on Tuesday, Wednesday and Thursday, January 10th, 11th and 12th, at the Imperial College of Science and Technology, South Kensington, from 3 to 6 p.m., and from 7 to 10 p.m. daily. More than eighty firms are to exhibit in the Trade Section this year, and in addition there will be a group of research and experimental exhibits by fellows of the Societies, research laboratories and institutions, and others. Historical exhibits will also be included.

The discourses in connection with the exhibition, which will be given at 8 p.m. on each evening, are to be as follows:—

On January 10th, Mr. A. Whitaker, M.A., of the Gramophone Company, Limited: "Progress in the Recording and Reproduction of Sound."

On January 11th, Mr. V. E. A. Pullin, B.A., O.B.E., F.Inst.P.: "Recent Applications of X-rays."

On January 12th, Mr. J. W. T. Walsh, M.A., D.Sc., F.Inst.P.: "Artificial Daylight."

We understand that invitations to the exhibition have been sent to the Institution of Electrical Engineers and other societies. As in previous years, members of these societies should apply for tickets to their secretaries. Others may obtain tickets on application to the Secretary, the Physical and Optical Societies, 1, Lowther Gardens, Exhibition Road, London, S.W.7. Tickets are required only on January 10th and 11th; admission on the third day will be without ticket.

Electrical Accidents in France.

According to an official return recently issued by the French Government, 144 accidents occurred during the year 1925 in 65 Departments of the country, these causing the death of 117 persons and injuries to 40 others; these figures compare with 144 accidents, 104 killed and 48 injured in 1924. Of the 157 victims in 1925, 74 persons were on the staff of the supply stations. A table shows that contact with h.p. conductors was the principal cause of accident, this being responsible for 62 of the cases.

Institute of Physics.

At a special general meeting of the Institute of Physics held on December 16th, and on the recommendation of the Board, the Royal Meteorological Society was admitted a Participating Society of the Institute. This is the sixth society to co-operate in the scheme of participation, and an important step is thus taken towards the realisation of one of the principal objects of the Institute, as expressed at its foundation, namely, to co-ordinate the work of all existing societies concerned with the science of physics and its applications.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Within the next day or two Mr. J. W. BEAUCHAMP vacates the position of director and secretary of the British Electrical Development Association, and Lt.-Col. W. A. VIGNOLES assumes control of the reins of office. Toward the end of last week the directors of the ELECTRICAL REVIEW, Ltd., entertained Mr. Beauchamp to luncheon at the Hotel Cecil for the purpose of expressing their appreciation of the perfect manner in which he had during his eight years of office placed himself at the disposal of the editors of the REVIEW and the journal as a whole in connection with its efforts to assist the Association in its great work. Mr. Beauchamp's reputation as an apostle of co-operation in the electricity supply industry dates back to the days when, as chief at Tunbridge Wells, he concentrated on the promotion of happy relations between his department and local contracting firms. His recent work as director of E.D.A. has, we feel sure, given him many opportunities for the exercise of his gifts of tact and patience, and the directors of the REVIEW took advantage of the occasion to wish him success in the very important task upon which he enters next week in South Wales. They also thanked him for the valuable service that he rendered to them, and to REVIEW advertisers, by the exercise of his experienced judgment and independence in deciding the merits of entrants in our two Advertisement Competitions. The South Wales area has its own power problems, but we have no doubt whatever that Mr. Beauchamp's knowledge of all branches of electricity supply activity, domestic, industrial, technical and commercial, in conjunction with his peculiar insight into human nature, will qualify him to understand them and find such a solution to them as will put the company on to the high road to greater commercial success.

Mr. ALFRED WATSON, B.Sc., Dundee, has received an important appointment under the Air Ministry Works and Buildings Directorate, which is responsible for all mechanical and electrical works in Royal Air Force establishments. He was with the Royal Air Force during the war, and on demobilisation studied at St. Andrew's University and took the engineering course at University College, Dundee. He graduated B.Sc. in both mechanical and electrical engineering. After practical training at the Dick, Kerr works of the English Electric Co. at Preston, he joined the head office staff in London. Until recently he held a responsible position for his company in connection with the Falls of Clyde hydro-electric power scheme.

Mr. JAMES W. MCKAY, the general secretary of the Electrical Wholesalers' Federation, and late British Trade Adviser at the German Embassy, has been unanimously elected president of the Mackay Clan Society of London, of which the Rt. Hon. Lord Reay is chief.

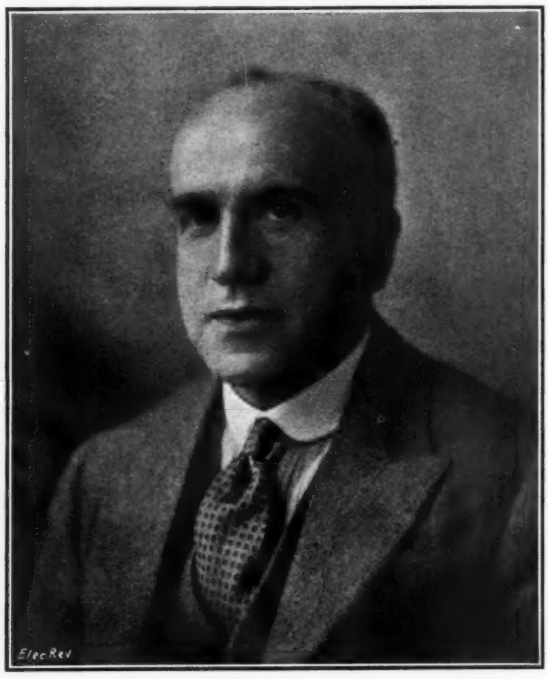
Science reports that Dr. IRVING LANGMUIR, of the General Electric Co. (U.S.A.), is to be presented with the Perkin Medal for 1928 on January 13th.

Messrs. MERZ & MCLELLAN announce that from January 1st their N.E. Coast address will be Carliol House, Newcastle-upon-Tyne. Their telephone numbers and telegraphic address will remain unchanged.

The Bradford Corporation Electricity Committee recommends a grant of £150 to nine members of the assistant technical staff in recognition of their heavy work and responsibility during the extension of the generating station and the change of system.

We regret that owing to his continued ill-health, and to the medical experts' report that this cannot be remedied if he continues to live and work in London, Mr. C. S. HANN, M.I.E.E., borough electrical engineer of Stoke Newington, is to retire on a superannuation allowance of £251 per annum, as from March 31st, 1928. Mr. Hann's health has been unsatisfactory since his return from active service in 1919. Leave of absence has been granted on two occasions, and he has now been granted leave of absence on full pay until superannuation becomes effective. The Electricity Committee has placed on record its thanks to him for faithful and efficient service since May, 1904, and expresses the hope, in which we and his many other friends will join, that his health will improve when he takes up his residence in South Africa.

We reproduce herewith a portrait of Mr. L. ROMERO, whose appointment as borough electrical engineer of Salford is recommended for confirmation by the Salford Electricity Committee. Mr. Romero took up the duties of the post when Mr.



Lafayette [*Manchester.*

Mr. L. Romero,
Borough Electrical Engineer of Salford.

S. J. Watson resigned to become chief engineer to the London and Home Counties Joint Electricity Authority earlier in the year. Mr. Romero, who is 44 years of age, has been in the service of the Corporation Electricity Department for about 20 years, and at the time of his appointment was mains engineer of the undertaking.

The Times states that last week Sir ERNEST RUTHERFORD, O.M., was elected a foreign associate member of the French Académie des Sciences. Sir Ernest was already a corresponding member of the Academy.

The *Financial Times* reports that owing to the state of his health Mr. A. O. PEECH is relinquishing the chairmanship of the United Steel Companies at the end of this year, and Mr. W. BENTON JONES becomes chairman with Mr. R. S. HILTON, at present deputy-chairman of the Metropolitan-Vickers Electrical Co., as sole managing director of the United Companies.

The marriage took place at Elmswell, Suffolk, on December 21st of Mr. FRANCIS HANNAM JOHNSON, manager of the electrical department of E. R. & F. Turner, of Ipswich, and Miss K. S. BAKER, of Elmswell.

Mr. D. LELAUNE, electrical engineer at Foulshiels Colliery (United Collieries, Ltd.) is leaving shortly to take up an appointment in India.

We are asked to state that Mr. T. P. WOOD has resigned his appointment as managing director of Wood & Co. (Ipswich), Ltd., electrical contractors, Ipswich, and that his private address is 29, Stradbroke Road, Ipswich.

Obituary.—MR. H. T. HOBDAY.—We regret to record that Mr. Henry Thomas Hobday, of Grey Court, Thorpe Bay, and Hobday Brothers, Ltd., passed away on December 23rd, at the age of 55 years. The funeral took place yesterday at Ilford.

ALD. W. THOMPSON.—The funeral took place, on December 20th, of Alderman William Thompson, of Blackburn, who died on December 16th. Alderman Thompson was a member of the Blackburn Town Council for 47 years and was the first chairman of the Electricity Committee. Later, when the tramway and electricity undertakings were separated, he was appointed hon. vice-chairman of both committees.

MR. A. B. HOLMES.—We record with regret the death of Mr. Arthur Bromley Holmes, M.Inst.C.E., formerly city electrical engineer of Liverpool, which occurred on December 27th at 2, Princes Gate, East Liverpool, "after a painful illness, bravely borne." The funeral service is to take place at St. Margaret's Church, Princes Road, Liverpool, to-morrow (Saturday). Mr. Holmes was born in 1849, and was thus in his 79th year. Mr. Bromley Holmes received his training as a civil engineer, and after some years spent in engineering construction work, he, in 1882, entered into partnership with Mr. J. C. Vaudrey, as consulting engineer. Not long thereafter the Liverpool Electric Supply Co., Ltd., was formed, and he was its manager from the first, passing over to the Corporation with the undertaking when it was purchased from him and its other founders in 1896. He was city electrical engineer of Liverpool from 1896 to 1903, and consulting engineer to the Corporation from 1903-1913. It will be remembered that Mr. Harold Dickinson, whose death occurred at the end of November last, went to Liverpool in January, 1913, and was city electrical engineer at the time of his death, so that the two men who have been responsible for Liverpool's electricity supply from its origin until the end of 1927 have passed away within a month. Mr. Holmes was also one of the founders of the Birmingham Electric Supply Company. He had written several books on electric lighting.

DR. J. SAHULKA.—The death recently occurred in Vienna, at the age of 70 years, of Dr. Johann Sahulka, a former editor of the Austrian *Elektrotechnik und Maschinenbau* and professor of electrotechnics at the Vienna Technical High School.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Newbridge on Wye Electricity, Ltd.—Private company. Registered December 21st. Capital, £1,500 in £1 shares. Objects: To carry on the business indicated by the title. The first directors are:—Sir Chas. L. D. V. Llewellyn, Bt., Llysdinan, Newbridge on Wye, H. J. L. Alford, Cambrian Steam Bakery, Newbridge on Wye; J. Powell, Cambrian House, Newbridge on Wye; J. J. Young, The Manse, Newbridge on Wye; W. Davies, Lion Stores, Newbridge on Wye. Solicitors: E. P. & A. L. Careless, Oxford Chambers, Llandrindod Wells.

Powdrill (Southampton), Ltd.—Private company. Registered December 19th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical dealers, &c. The directors are: A. H. Powdrill, "Medina," 20, Leighton Road, Itchen, Southampton, accountant; H. A. Lee, "Thornlee," Cunard Avenue, Shirley, Southampton, chartered secretary. Secretary: A. H. Powdrill. Registered office: 12, London Road, Southampton.

Variocycles, Ltd.—Private company Registered December 22nd. Capital, £2,000 in £1 shares. Objects: To acquire from F. D. Winslow the benefit of the patents (when obtained) for Great Britain, Northern Ireland, the Irish Free State, and Belgium, in respect of an invention relating to tuning apparatus for the reception of wireless or radio waves (provisional specification No. 11405/27) and to adopt an agreement between F. D. Winslow and E. A. Milbank. The first directors are: F. D. Winslow, 18, Windsor Road, Worthing, wireless and electrical engineer; V. H. Poynter, "Furzeholme," High Salvington, Sussex, company director; E. A. Milbank, The Oaks, High Salvington, gentleman (all permanent). Solicitors: Marsh & Ferriman, Worthing.

Wire and Nail Corporation, Ltd.—Private company. Registered December 21st. Capital, £1,000 in 1s. shares. Objects: To carry on the business of manufacturers of and dealers in wire products, and insulated, electrical, and other wires, &c. The subscribers (each with one share) are: C. T. H. Bull, 57, Turners Road, E.3, commission agent, and another. Solicitors: Sutton, Ommanney and Oliver, 3-4, Great Winchester Street, E.C.2.

Zelco, Ltd.—Private company. Registered December 21st. Capital, £1,000 in £1 shares. Objects: To acquire the registered trade mark "Zelco," to adopt an agreement with I. Weiner, and to carry on the business of manufacturers of and dealers in electric, gas, and other lamps, fittings, &c. The permanent directors are: I. Weiner and M. Weiner, both of 53, Goldhurst Terrace, N.W.6. Registered office: 5, Dyers Buildings, Holborn, E.C.1.

Wilton Electricity Supply Co., Ltd.—Registered as a "public" company on December 17th, with a nominal capital of £5,000 in £1 shares. The objects are to carry on the business of an electric light and power company in all its branches, &c. The minimum cash subscription is 7 shares. The first directors are:—C. J. Woodrow, J.P., The Grange, St. Mark's Avenue, Salisbury; A. C. Bothams, "Roundabout," Durnford, Salisbury; A. N. Rye, "Woodland," Wellington Avenue, Virginia Water, Surrey; C. H. Jones, 67, Hayes Road, Bromley, Kent. Registered office: 27, Market Place, Salisbury.

Punter, Bayes & Co., Ltd.—Private company. Registered December 9th. Capital, £1,000 in £1 shares. Objects:—To carry on the business of consulting and inspecting engineers, manufacturers of, and dealers in electrical batteries, machinery, &c. The first directors are:—A. Punter, 36, Hartswood Road, Stamford Brook, W.12; and J. R. Bayes, 196, Shinfield Road, Reading, Berks. Secretary: A. Punter. Registered office: 31, Eastcheap, E.C.3.

Official Returns of Electrical Companies.

County of London Electric Supply Co., Ltd.—Capital, £7,000,000 in 3,500,000 6 per cent. cum. pref. and 3,500,000 ordinary shares of £1 each. Return dated April 12th, 1927. 3,225,000 preference and 3,103,334 ordinary shares taken up. £4,449,220 paid on 3,225,000 preference and 1,224,220 ordinary shares. £1,879,114 considered as paid on 1,879,114 ordinary shares. Mortgages and charges, £500,000.

A. Smethurst & Sons, Ltd.—R. A. Blackford, of 83, Above Bar, Southampton, ceased to act as receiver or manager on December 10th, 1927.

Lewes and District Electric Supply Co., Ltd.—Capital, £50,000 in 2,500 preference and 2,500 ordinary shares of £10 each. Return dated June 13th, 1927. 2,327 ordinary shares taken up. £23,270 paid. Mortgages and charges: £20,000.

Boston and District Electric Supply Co., Ltd.—Capital, £20,000 in £1 shares. Return dated August 11th, 1927. All shares taken up. £20,000 paid. Mortgages and charges, nil.

I. T. C., Ltd.—Capital, £20,000 in £1 shares. Return dated July 1st, 1927. 15,000 shares taken up. £15,000 paid. Mortgages and charges, nil.

Le Bas Tube Co., Ltd.—Satisfaction to the extent of £10,000 on December 14th, 1927, of debentures dated May 11th, 1925, securing £50,000.

Oriental Telephone and Electric Co. Ltd.—Satisfaction to the extent of £5,946 on December 13th, 1927, of debenture stock secured by trust deed dated June 28th, 1905, and supplemental deed of acknowledgement dated June 12th, 1907, securing £200,000.

Ilfracombe Electric Light and Power Co., Ltd.—Capital, £25,000 in £5 shares. Return dated June 27th, 1927. 5,000 shares taken up. £25,000 paid. Mortgages and charges, nil.

Jarrow and District Electric Traction Co., Ltd.—Capital, £60,000 in £1 shares. Return dated April 27th, 1927 (filed July 28th). 59,934 shares taken up. £49,945 paid, £9,989 considered as paid. Mortgages and charges: £1,400.

Caxton Electric Developments, Ltd.—Capital, £300,000 in £10 shares. Return dated June 6th, 1927. 20,000 shares taken up. £70 paid, £119,930 considered as paid. Mortgages and charges: £200,000.

Telegraph Condenser Co., Ltd.—Capital, £5,000 in £1 shares. Return dated July 23rd, 1926 (filed December 1st, 1927). All shares taken up. £2,000 considered as paid. Mortgages and charges, nil.

Erewash Electric Wire Co., Ltd.—Particulars filed of £1,000 debentures authorised December 2nd, 1927, charged on the company's undertaking and property, including uncalled capital, the whole amount being now issued.

Octron, Ltd. (formerly H-S Electric, Ltd.).—Debenture dated November 25th, 1927, to secure £3,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: R. G. Marr & Co., Ltd., Pinners Hall, Austin Friars, E.C.

Whitchurch and Pangbourne Electric Supply Co., Ltd.—Capital, £10,000 in 300 preference and 1,700 ordinary shares of £5 each. Return dated May 25th, 1927. 1,700 shares taken up. £8,500 paid. Mortgages and charges, nil.

Hart Accumulator Co., Ltd.—Capital, £200,000 in 20,000 preference and 180,000 ordinary shares of £1 each. Return dated July 13th, 1927. 19,523 preference and 156,708 ordinary shares taken up. £38,411 paid on 7,059 preference and 31,352 ordinary shares. £137,820 considered as paid on the remainder. Mortgages and charges, nil.

Folkestone Electricity Supply Co., Ltd.—Capital, £200,000 in 140,000 ordinary, 50,000 preference, and 10,000 employés' co-partnership shares of £1 each. Return dated April 8th, 1927. 100,000 ordinary, 50,000 preference, and 10,000 employés' shares taken up. £160,000 paid. Mortgages and charges, £99,100. Returns of allotments made up to August 12th, 1927, show a further 40,000 ordinary shares allotted, payable in cash and fully called up.

West African Telegraph Co., Ltd.—Capital, £400,000 in £10 shares. Return dated July 27th, 1927. 23,109 shares taken up. £231,090 paid. Mortgages and charges, nil.

Herd & Snowden, Ltd.—Capital, £500 in £1 shares. Return dated April 29th, 1927. 261 shares taken up. £261 paid. Mortgages and charges, nil.

Auto-Sign Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1926 (filed June 23rd, 1927). All shares taken up. £500 paid. £500 considered as paid. Mortgages and charges, nil.

Plessy Co., Ltd.—Capital, £20,000 in 16,000 preference shares of £1 each and 80,000 deferred shares of 1s. each. Return dated April 27th (filed August 4th), 1927. 16,000 preferred and 60,002 deferred shares taken up. £1,550 2s. paid on 31,002 deferred shares. £17,450 considered as paid on 16,000 preferred and 29,000 deferred shares. Mortgages and charges, £100 (covered by mortgage up to £7,000).

Castle Fuse and Engineering Co., Ltd.—Capital, £15,000 in £1 shares. Return dated June 13th, 1927. 11,502 shares taken up. £9,500 paid. £2,000 considered as paid. £2 in arrears. Mortgages and charges, nil.

Dalgetti Electric, Ltd.—Capital, £500 in £1 shares. Return dated June 8th, 1927. 150 shares taken up. £150 considered as paid. Mortgages and charges, nil.

Barrow & Co., Ltd.—Capital, £5,000 in £1 shares. Return dated June 9th, 1926. 1,604 shares taken up. £4 paid. £1,600 considered as paid. Mortgages and charges, nil. Return of allotments made up to May 26th, 1927, shows a further 15 shares allotted, payable in cash, and fully called up.

Atlas Light and Power Co., Ltd.—Particulars of £2,442,945 debenture stock, plus premiums relating thereto (inclusive of amounts of £1,200,000 and £889,757 secured by trust deeds dated March 12th, 1909, February 10th, 1922, July 16th, 1923, and December 31st, 1926, respectively) authorised November 21st, 1927, and covered by acknowledgment of indebtedness of same date (supplemental to the said trust deeds), the present issue being £530,000 (inclusive of £176,812 remaining unissued under previous deeds), and constituting a specific charge on certain shares and securities of other companies, and a floating charge on the company's undertaking and property, present and future, including uncalled capital. Trustees:—Col. C. W. Trotter, C.B., W. K. Whigham, Rt. Hon. A. E. Murray, Earl of Dunmore, V.C., M.V.O., and N. G. Touche.

(The debenture issue ranks, *pari passu*, with £1,023,188 debenture stock, part of the above-mentioned £1,200,000, and, except as regards interest and redemption, with the £889,757 debenture stock already issued.)

West Coast of America Telegraph Co., Ltd.—Capital, £232,520 in 53,008 ordinary shares of £2 10s. each and 100,000 preference shares of £1 each. Return dated May 24th, 1927. 45,008 ordinary and 100,000 preference shares taken up: £100,020 paid on 8 ordinary and 100,000 preference shares. £112,500 considered as paid on 45,000 ordinary shares. Mortgages and charges, nil.

Illuminated Advertising Co., Ltd.—Particulars filed of £1,500 debentures authorised December 9th, 1927, the whole amount being now issued. Property charged: the company's undertaking and property, present and future, including uncalled capital (subject to previous series for £1,000 created December 1st, 1927).

City Notes.

Marconi's Wireless Telegraph Co., Ltd.

This company's report for 1926 was reviewed in our issue of December 16th (p. 1047). The annual meeting was held on December 22nd, when Lord Inverforth (chairman), who presided, apologised for the absence of Senatore Marconi on account of ill-health. Dealing with the accounts, Lord Inverforth mentioned the heavy burden constituted by the debenture interest and redemption, amounting to about £160,000 a year. The stocks and contracts in progress showed an increase of approximately £300,000. That was due mainly to expenditure incurred in connection with the beam stations, and was largely represented by work in progress on contracts which were practically completed. Although the figure for holdings in, and advances to, associated companies showed a small decrease, they had increased their holdings in the Indian, Australian, and South American companies, and had made further advances to the Canadian, South African and Portuguese companies. The advances to the South African and Portuguese companies would be exchanged into shares at a later date; those made to the Canadian company had already been converted into shares. The latter had been sold and largely accounted for the improvement in the company's cash position. Information received from the Indian and South African companies showed that the gross receipts were largely in excess of their working expenses, leaving a balance for dividends; that was very satisfactory considering the short period during which the beam stations had been in operation. The directors had recommended only a small dividend, as they did not feel justified, in view of their debenture policy, in making a larger distribution. The construction programme which was commenced in 1925 was now practically completed. In addition to the beam stations which had been erected for the Post Office and their associated companies, in Canada, Australia, South Africa, and India, the company had erected beam stations for communication with North and South America. The provision of stations for the Portuguese company had involved an expenditure of some £350,000. They had formed a company in Egypt which had acquired the Post Office station at Abu Zabal. It had a capital of £180,000, a third of which was subscribed by a powerful Egyptian group. In partnership with the Radio Corporation of America, the company had reorganised the wireless services of Colombia, and a direct service between Bogota and New York was opened in August last. The company, in combination with the American, French and German wireless telegraph companies, had a large holding in the companies in Argentina and Brazil. The former was already on a paying basis; the Brazilian company was showing improving results, and the opening of the beam services should steadily improve the position. Taken as a whole, the position of the associated companies was satisfactory and improving. A 20-year contract for the administration of the postal, radio-telegraphic and telegraphic services of Bolivia had been secured. They had effected considerable improvements, and they were confident of being able to produce results as satisfactory as those which had followed their administration of the postal service in Peru. Under an arrangement with Lazard Bros. & Co., Ltd., the company had disposed of its holding in the Canadian company. Payment was received largely in cash, but the balance was in shares in a holding company which had been formed to control the policy of the Canadian company.

The total orders for the first eleven months of 1927 substantially exceeded those for the whole of 1926, but the full effect would not be felt at once. Although there was severe competition in the provision of broadcasting apparatus, the company was securing a large and increasing proportion of the business. During the past year it had supplied three broadcasting stations to Japan, two to India, and one each to Italy, Sweden and Austria, and it had recently received an order for a station for Czecho-Slovakia. A short-wave station had been erected for the B.B.C. at the company's Chelmsford works, and the company was collaborating in experimental work with the Corporation. A new wireless station was being installed at Croydon for the Air Ministry, which would be the most modern and efficient aircraft wireless station in the world. The company had worked in conjunction with two gramophone companies in the development of a new recording system and an electric gramophone.

Special apparatus had been constructed for beam telephony, and preparations were being made for trials on a commercial scale. There were many difficulties, but the results so far had been distinctly encouraging. Lord Inverforth hoped that it would not be long before they were able to give an efficient telephone service between this country and the Dominions now served by the beam system. Progress in the transmission of facsimile telegrams had been good. The efficiency of the beam service had been sufficiently demonstrated by the fact that the Government was now considering the effect of beam competition on the revenue of the State-owned cable services. There had been a great deal of discussion upon the relations between wireless and cables. He was quite confident that no action would be taken by the Government which would in any way hamper the development of the wireless-telegraph services of the Empire. If the beam system was able to carry trade telegrams more cheaply than any other system, then nothing must be done to take away that advantage from the trading interests of the Empire. In moving the adoption of the report, Lord Inverforth said that the board had received proxies for 1,025,056 shares and Mr. Nordon proxies for 55,147 shares. Mr. F. G. Kellaway (deputy chairman and managing director) seconded the motion, and after a discussion the report was adopted.

Cape Electric Tramways, Ltd.

Mr. L. Breitmeyer (chairman) presided at the annual meeting on December 21st, and in presenting the report and accounts (Elec. Rev., December 16th, p. 1048) said that the accounts for the year ended June 30th last showed that the combined receipts of the Cape Town and Port Elizabeth tramway undertakings had declined by £17,013. On the other hand the company's 'buses had earned £43,008, so that the net result was an increase in receipts. The competition from motor 'buses which the company had to face had grown in severity and in self-defence they had been compelled to run 'buses themselves. The full advantage of the agreement with the Municipality for the supply of electricity had not been realised owing to a delay in the completion of the arrangements. They had therefore had to keep their own station running longer than was anticipated, but now the full supply was being obtained from the Municipality and the station had been closed down. The relaying of the track had been proceeded with at a cost of £29,806, of which £25,250 had been debited to operation. The directors were disappointed at having to reduce the dividend, but their available funds had been heavily drawn upon by the large capital expenditure incurred and their liquid resources had to be conserved to provide the means to deal with the further expenditure required to meet the 'bus competition. They hoped, however, that the reduction was only a temporary one. The methods of competition adopted by their rivals were grossly unjust, but it was hoped that official regulations for the control of all motor 'buses would soon come into force and that should put the company on a more even level with its opponents.

Burndept Wireless, Ltd.

The Receiver and Manager of the company, who was appointed in June last, has issued a report. This shows that the total deficiency at the date of his appointment was £216,550. Since that date, however, the Receiver has been successful in carrying on the business at a profit after meeting depreciation, interest on prior charges, &c. The company's Blackheath factory is fully employed, and the reports of travellers show that there is still a real demand by the public for the company's products. In the Receiver's opinion the results and the present position of the radio industry justify the hope that the sales of the company will be maintained and that the company will continue to earn trading profits. The setback consequent upon his appointment has been overcome, and he is receiving the full support of the company's organisation. The research department has continued to produce new and improved models at reduced prices, and others are shortly to be placed on the market. The directors of the company propose that the Receiver should carry on the business as a going concern for at least another three months. If the results continue to be satisfactory the directors hope to be able to submit a scheme for the reorganisation or sale of the business on terms "not too unfavourable to the shareholders." At the meeting to-day (Friday) the directors will suggest the appointment of a committee of shareholders to assist them in formulating future policy.

Hall Telephone Accessories, Ltd.

An extraordinary meeting is to be held to-day (Friday) for the purpose of considering a scheme of reorganisation to cope with the expanding business and to take cognisance of the recent acquisition of the British Stamp and Ticket Automatic Delivery Co. It is proposed to form a new company, Hall Telephone Accessories (1928), Ltd., with a capital of £140,000 in fully-paid 10s. shares, to take over the business as from January 1st, 1928. The shareholders will be allotted 238,003 fully-paid new shares, which represents eight new 10s. shares for each £1 share at present held. The balance of the new shares are to be underwritten by Guests Trust, Ltd., and permission to deal in the shares on the Stock Exchange will be applied for. This arrangement will provide means of repaying the £10,000 of debentures still outstanding and funds for further capital expenditure.

Low Temperature Carbonisation, Ltd.

The report for the year ended July 31st states that at that date the reconstruction of capital sanctioned by the Court had nearly been completed. Carbonising in one battery at the new works had been in operation for four weeks. The output of the works is now 70 per cent. of the maximum, and the demand for "coalite" and the oil from the coal is eminently satisfactory. The directors claim that the process is now completely successful from the technical and commercial points of view. Arrangements are being made for the erection of further plants. Lt.-Col. W. A. Bristow, M.I.E.E., has been appointed managing director, and Mr. C. H. Parker, J.P., has joined the board. Meeting: To-day (Friday).

Southern Brazil Electric Co., Ltd.

The annual meeting was held on December 21st, Mr. E. H. Tootal (chairman) presiding. In presenting the report and accounts (*vide* our last issue, p. 1093), the chairman said that the late appearance of these was due to a variety of causes, among which was the considerable amount of extra work in connection with the recent issue of prior lien bonds and changes in the Sao Paulo staff. The results were about the same as those of 1925 owing to the fall in exchange. A considerable amount of revenue (about £33,000) had to be utilised during the year mainly to meet obligations on the part of subsidiary concerns under existing contracts for the extension of services. A large amount had been expended in this way and the value of the assets of the company had thereby been increased. To satisfy future requirements the directors had obtained sanction to issue £300,000 of 7 per cent. prior lien bonds, of which £200,000 had been actually placed. They had been able to pay off the arrears of interest on the 6 per cent. mortgage debentures. The proposed stabilisation of the Brazilian milreis at 5 15/16d. would create a serious position for foreign companies working in Brazil. In most cases the rates of charge for electricity were fixed when the milreis stood at 16d. The Government had shown its recognition of the altered state of affairs by doubling the postal and telegraph rates and by increasing the freight rates on the State Railway. It would be manifestly unfair to expect public utility companies to continue to operate at rates which were fixed long ago under very different conditions. They had instructed their managing director in Sao Paulo to press for a revision of rates all round, and they had every hope that he would succeed in convincing the authorities that that was only just and reasonable. Given fair rates the future of the company would show material improvement.

Sudan Construction and Equipment Co.

The *Financial Times* states that the report for the year ended October 31st, 1927, shows that at the harbour works at Port Sudan the erection of the new coal transporters is now practically complete, with the exception of minor work, such as lighting arrangements, &c., which is now in progress. The submarine cable laid for the purpose of transmitting power from the power house on the east side of the harbour to South Town has been completed and tested with the transporters. The construction of two new coal quays at Port Sudan, South Town (Quarantine Island), has been completed, and other ancillary works are in hand. It is anticipated that both quays and transporters will be ready for public service by end of January, 1928. Work in connection with the extension of the main quays has progressed, and it is hoped that the extension will be completed by July, 1928. Two 70-ft. A.G.A. beacons and two 20-ft. post lights have been erected and are functioning correctly.

Edison Swan Electric Co., Ltd.

The report for the year ended June 30th last records a net profit of £59,508, after providing for debenture interest, &c. This compares with £71,405 in the preceding year and £88,344 in 1924-25. A balance of £29,038 is brought forward, making £88,546. The directors propose to maintain the ordinary dividend at 10 per cent., to transfer £30,000 to reserve (against £40,000) and to carry forward £31,902. The meeting is to be held to-day (Friday).

Constantinople Telephone Co., Ltd.

In March, 1925, the holders of the bonds and certificates of the company agreed to the postponement of the payment of their interest until January 1st, 1928. The accrued amounts are now to be paid on or after that date. The sums payable (including interest), subject to tax, are £19 6s. 11d. in the case of the bonds and £4 5s. 6d. upon the certificates.

Sir W. G. Armstrong, Whitworth & Co., Ltd.

It is announced that the personnel of the reconstructed board is as follows:—Loud Southborough (chairman), Mr. J. Frater Taylor (deputy chairman), Sir Eustace Tennyson d'Eyncourt, Mr. J. Ferguson, Sir George Hadcock, Mr. J. Hawson, Lt.-Col. C. F. Hitchins, Mr. B. Irving, Mr. J. D. Siddeley and Mr. J. Stewart.

Foundation Co., Ltd.

The profit for the year ended June 30th last was £21,055 (against £16,424) and to it is added £16,503 brought forward, making £37,558. Provision for taxation takes £5,000, £5,528 is written off preliminary expenses, the dividend is paid on the 8 per cent. cumulative preference shares, and a balance of £17,430 is carried forward.

Claud Hamilton, Ltd.

The directors propose to pay the preference dividend out of the past year's profits and to carry forward a balance of £6,274. The preference dividend was paid in the preceding year but the ordinary shares have received nothing since 2¼ per cent. was distributed in 1922-23.

W. & T. Avery, Ltd.

An interim dividend of 5 per cent. (payable January 2nd) has been declared on the ordinary shares.

Major & Co., Ltd.

There was a loss of £2,742 during the year ended March 31st last, this has been deducted from the amount brought forward (£16,062) and from the balance the dividend on the 6 per cent. cumulative preference shares is paid, leaving £10,320 to be carried forward. The meeting was to be held yesterday (Thursday).

Lisbon Electric Tramways, Ltd.

An interim dividend of 3 per cent. (net) has been declared on the ordinary shares, including the recent issue, as in 1926.

Quebec Railway, Light, Heat and Power Co.

A dividend of $2 per common share has been declared in respect of the year just ending.

Montreal Light, Heat and Power Consolidated.

A dividend of $0.5 per share has been declared on the common shares for the quarter ending December 31st.

Falkirk Iron Co., Ltd.

An interim dividend of 4 per cent. has been declared on the ordinary shares; last year's interim dividend was 5 per cent.

Japanese Companies' Amalgamation.

The Tokyo correspondent of *The Times* reports that the terms for consolidating the Tokyo Electric Light and the Tokyo Electric Power Companies are virtually completed. The companies represent 15 per cent. of the total capital of the electrical industry of Japan, and 19 per cent. of the generating capacity. Prolonged rate-cutting in the Tokyo area prompted financial interests to exert their influence in effecting this amalgamation. The consideration that further foreign financing, which the industry requires, would be difficult unless competition was eliminated was also a factor in effecting the merger, the basis of which is nine shares of the Light company to ten of the Power company.

Indian Companies.

Tata Hydro-Electric Power Supply Co.—The income for the year ended June 30th last amounted to Rs. 55,30,693 (against Rs. 50,46,511 in 1925-26). After meeting working and other expenses there was a balance of Rs. 25,43,598, compared with Rs. 19,82,934. The addition of Rs. 1,75,763 makes available Rs. 27,19,361. A sum of Rs. 3,00,000 is set aside (with Rs. 3,80,613 from the reserve) for bad and doubtful debts, and after providing for proportion of debenture interest and loss on the sale of mill equipment as compared with the book value, and for interim dividends, there remains Rs. 13,64,295. A final dividend at the rate of 8 per cent. per annum, free of tax (making 8 per cent. for the year as in 1925-26) is to be paid on the ordinary shares, leaving Rs. 2,27,097 to be carried forward.

Andhra Valley Power Supply Co.—The report for the year ended June 30th last shows an income of Rs. 69,97,141 (against Rs. 58,41,627). After meeting expenses, including debenture interest and depreciation, the balance is Rs. 19,99,612 as compared with Rs. 9,73,882. A balance of Rs. 1,03,558 brought forward is added, and the total, Rs. 21,03,201, is distributed as follows:—Writing off balance from previous year, Rs. 3,33,995; writing off preliminary expenses, Rs. 4,23,749; depreciation of investments, Rs. 1,35,000; dividend at 4 per cent., free of tax, on the ordinary shares (against *nil* in 1925-26); carried forward, Rs. 2,27,097.

Stocks and Shares.

TUESDAY EVENING.

IN a year that will long be remembered by the Stock Exchange as "featuring," to quote the films, a boom in shares of industrial companies, the ups and downs of prices in electricity undertakings have been remarkably mixed. A slump in cable companies' stocks has run side by side with a substantial rise in equipment and manufacturing shares. From 106, at the end of last year, Brazilian Tractions have more than doubled in price, being 224 to-day, and it may be recalled that the shares stood at 84 in December, 1925. British Electric Traction was quoted at 144½ a year ago; the stock has been divided during the present twelvemonth, and the deferred stands at 500 now. It is not only in artificial silk, talking-machine and triplex glass shares that price movements of the spectacular order have occurred.

London Electricity Supply.

London electricity supply shares, having come on to a standard of fixed dividend, after 1931, are affected by monetary factors more than other considerations. Several of the companies are rather different from the rest. Shares in the Charing Cross, Metropolitan, City of London and County of London undertakings have somewhat greater attractions than the others. We set out a representative list, but the rises in prices on the year in the cases of the City Company, the Brompton, and the Metropolitan are left blank on account of the special circumstance that prevailed at the beginning of 1927. It will be a cause of distinct satisfaction for holders of the other shares to observe the upward progress of prices during the period under notice:—

Electricity Supply Shares.

Ordinary.	December 1925.	December 1926.	Now.	Rise.
Brompton	1⅛	1⅛	24/6	—
Charing Cross	48/9	25/-	26/-	1/-
Chelsea	42/6	25/-	25/6	6d.
City of London	50/9	42/6	30/-	—
County...	59/6	26/-	28/6	2/6
Kensington	13½	24/-	25/6	1/6
London	33/6	24/-	25/-	1/-
Metropolitan	40/6	30/6	30/-	—
St. James'	15½	24/-	26/-	2/-
South London...	2¼	24/6	25/6	1/-
Westminster	46/6	24/6	25/6	1/-

In view of the great interest taken in the reorganisation of capital accounts in the London companies, it may be of service to recall the terms of the new issues given by the companies to their proprietors. Therefore, the list, given here a year ago, may be usefully reprinted :—

Company.	Old Shares.	New (bonus).
Brompton	5	1
Charing Cross	5	4
Chelsea	5	3
City of London	2	1
County of London	3	4
Kensington	5	9
London	5	2
Metropolitan	2	1
St. James'	5	11
South London	10	9
South Metropolitan	5	7
Westminster	3	2

Cables and Wireless.

The development of the Beam system and the inroads made upon the business of the submarine cable companies have resulted in a slump amongst the ordinary securities of the latter. Great Northerns alone have escaped. How heavy the depreciation in other issues has been, this table tells in melancholy manner :—

Cable Stocks and Marconi's.

Stock or share.	Dec., 1925.	Dec., 1926.	Now.	Rise or fall.
Anglo-American Pref.	103	101	93½	— 7½
Eastern Extension	18	17¼	15	— 2½
Eastern Telegraph	177½	177½	145	— 32½
Globe Ord.	18½	18½	14⅜	— 3⅛
Great Northern	33	27	38½	+ 11½
Indo-European	45½	47½	40	— 7½
Marconi	2/6	13 9	37/6	+ 23/9
Western Telegraph	18	17½	14	— 3½

Marconis, it will be seen, have nearly trebled in price. The company has returned to the dividend-list, and its capital account, the subject of much heated discussion during the year, is on the point of reorganisation. Canadian Marconis have gone sharply ahead, rising from 3s. 9d. to 9s. 9d. Marconi Marines have come up from 22s. 6d. to 30s., the company increasing its dividend in the present year.

Home Rails.

Owing to the introduction of greyhound racing as a new and popular "sport," a jump occurred in the price of Metropolitan Railway stock. Rumour, moreover, is again talking of the likelihood of the Metropolitan being absorbed by the Underground Electric Railways of London. Districts have advanced substantially, on dividend hopes. Our list has only rises to show :—

Railway Stocks and Shares.

Stock or share.	December 1925.	December 1926.	Now.	Rise.
Central London Ord. ...	68	69	71	2
Metropolitan	69	63	70	7
District	47	53½	66	12½
Underground "A"	7/-	12/-	19/6	7/6
" Income ...	98	103	105	2

London United Tramways 4 per cent. debenture at 54½ is 12 points to the good on the year; London and Suburban Traction preference, after touching half-a-guinea, are 1s. 6d. up at 8s. Mexico Tramways Fives at 72 have added 10 points to their last December's quotation. Mexican Light and Power common at 61 are 30 points up. Anglo-Argentine Tramways first and second preference, both at 3¾, are 17s. 6d. higher. It has been a good year for holders of most of the foreign utility issues.

The Manufacturing Group.

Many rises have occurred in the list of manufacturing shares. Gossip concerning a likely amalgamation of a number of the big concerns has had a favourable effect upon business and prices. British Insulated have come up from 67s. 6d. to 81s. 3d. Siemens end the year as they began it, at 30s. Some of the other movements are :—

Manufacturing

Share.	December 1925.	December 1926.	Now.	Rise or fall.
Babcock	2⅞	2⅞	3⅛	+10/-
British Aluminium	98/-	48/-	45/6	— 2/6
Callender's	9⅛	8 7/16	9 15/16	+10/-
General Electric	2-/-	31/-	33/6	+ 2/6
Henley's	70/-	4⅜	5⅛	+15/-
India-Rubber	21/3	21/3	13/9	— 7/6

Telegraph Constructions at 24½ have shed £5, due to the wireless boomlet. Johnson & Phillips at 51s. 9d. are 8s. 3d. lower on the year. Edison Swan at 10s. show a decline of 2s. 9d.; English Electrics as 8s. 9d. are down 6s. 3d., the latter amount being the gain secured by Metropolitan-Vickers ordinary at 30s. The present year ends in the Stock Exchange upon a decidedly hopeful note. It is not only complimentary, it is very reasonable to look for fulfilment of the cordial wish that those interested in electrical finance may enjoy a Prosperous New Year in 1928.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Dividend. 1925.	Dividend. 1926.	Price Dec 27 1927.	Rise or fall.	Yield. p.c.
Bournemouth and Poole	1	14	14	60/6	+1/6	4 12 10
Brompton Ordinary	1	10	8¾	24/6	—	5 14 3
Charing Cross Ordinary ...	1	15	8½	26/-	+6d.	5 7 8
do. do. 4½ Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	8½	25/6	—	5 9 10
City of London	1	15	7½	30/-	—	4 0 0
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Clyde Valley	1	8	8	32/-	—	5 0 0
County of London	1	15	7½	28/6	—	4 18 3
do. do. 6% Pref. ...	1	6	6	26/-xd	+6d.	5 4 4
Edmundson's Ordinary	1	8	10	45/-	—	4 8 11
do. 7% Pref.	1	6	7	24/6	—	5 14 3
Elec. Supply Corporation	1	10	10	33 9	—	5 18 6
Kensington Ordinary	1	15	8	25/6	—	5 9 10
Lancs. Light and Power	1	7½	7½	27/-	—	5 11 1
London Electric	1	10	8½	25'-	+6d.	5 12 0
do. do. 6% Pref.	5	6	6	5⅞	—	5 11 3
Metropolitan	1	11	8	30/-	—	4 18 4
do. 4½% Pref.	1	4½	4½	17/-xd	+3d.	5 8 6
Midland Counties	1	5½	6	24/-	—	5 0 10
Newcastle-on-Tyne Ordinary ...	1	7	8	28/9	—	4 4 3
do. 5% Pref. ...	1	5	5	17/6	—	5 14 3
do. 7% Pref. ...	1	7	7	25'-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10¾xd	+¼	5 10 4
North Met. Elec. 6% Pref. ...	1	6	6	22 6	—	5 6 8
St. James' and Pall Mall	5	17½	8	26/-	—	5 7 8
South London	1	15	8½	25/6	—	5 9 10
South Metropolitan Pref.	1	7	7	1¼	—	6 8 0
Urban Ordinary	1	7	7	1 1/16	—1/16	5 16 8
do. 6% Pref.	1	6	6	1 1/16	—	5 18 0
Westminster Ordinary	1	15	8½	25/6	—	5 9 10
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	21/8	—	7 1 2
Yorkshire Elec.	1	8	8	32/-	—	5 0 0

Home Rails.

Central London Ord. Assented ...	Stock	4	4	71	—	5 12 8
Metropolitan	,,	5	5	70	+5½	4 5 8
do. District	,,	9½	9½	66	+2½	5 6 1
Underground Electric	£1	Nil	1½	19/6	—	1 10 7
do. do. Income ...	Bonds	6	6	105	—	5 14 3

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	93½	—	6 8 4
do. Def.	,,	1½	1½	24	—	6 3 9
Automatic Telephone	1	3	10	46/3	—	4 6 6
Chili Telephone	5	5	6	7⅞	—	3 18 3
Eastern Extension	10	10	10	15	—	*6 13 4
Eastern Tel. Ord.	Stock	10	10	14⅞	—3	*6 17 4
Globe Tel. and T. Ord.	10	10	10	14⅞xd	—	*6 15 7
do. do. Pref.	10	6	6	10½xd	—⅛	5 4 6
Great Northern Tel.	10	20	20	38½	—½	5 3 0
Indo-European	25	8½	10	40	—	*6 5 0
Marconi	1	Nil	Nil	37/3	+6/3	.. ..
Marconi-Marine	1	7½	8⅜	30/-	—	5 16 8
Oriental Telephone Ord.	1	12	12	50/-	—	*4 16 0
United R. Plate Tel.	5	8	8	9⅛	+⅛	*4 1 0
Western Telegraph	10	10	10	14	—	*7 2 10

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	£2½xd	+⅛	7 6 8
do. do. 2nd Pref. ...	5	8	8	£2xd	+⅛	8 0 0
do. do. 5% Deb. ...	Stock	5	5	74½	—	6 14 3
British Electric Traction Def. Ord.	,,	8	8	500	—	... ...
do. do. 8% Pref. Ord.	,,	8	8	123½	—	6 9 7
Brazil Traction	100	5	6	224	—2	2 13 ...
Brit. Columbia Elec. Ry. Pcc. ...	Stock	5	5	99½	—	5 6 11
do. do. Preferred ...		6¾	6¾	148½	+5	4 4 3
do. do. Deferred ...	,,		8	168	+5	*4 5 1
do. do. Deb. ...	,,	4¾	4¾	99	—	4 5 6
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	8/-	—	... ...
London United Tram. Deb. ...	Stock	4	4	54½xd	+1¼	7 6 7
Mexico Trams, 5% Bonds	—	5	5	72	—	6 18 11
Mexican Light Common	100	Nil	Nil	61	+2	Nil
do. Pref.	100	Nil	Nil	74	—	Nil
do. 1st Bonds	—	5	5	78½	+1	6 8 0
Yorkshire (West Riding)	1	8	—	7/6	—	... ...

Manufacturing Companies.

Babcock & Wilcox		12	12	3⅛	+3/16	4 3 4
British Aluminium Ord.	1	12½	10	45/6	—	4 8 0
British Elec. Transformer Prel. ...	1	Nil	7	18/9	—	7 18 6
British Insulated Ord.	1	15	15	4 3/16	—	3 14 0
Brush Ord.	1	10	10	29/9	—	6 16 4
Callenders	1	15	15	3½	—	3 16 4
do. 6½% Pref....	1	6½	6½	23-xd	-9d.	5 9 6
Crompton Parkinson Pref. Ord. ...	1	Nil	Nil	16/-	—	... ...
Edison-Swan	4/-	10	10	10/-	.. ..	4 0 0
do. 5% Deb.	Stock	5	5	84xd	+2	5 18 6
Electric Construction	1	10	7½	26 3	—9/6	5 14 3
Enfield Cable Pref.	1	7½	7½	23 1 xd	-9d.	6 6 0
English Electric	1	Nil	Nil	8/9	—	... ...
do. do. Pref.	1	8	—	11/9	+6d.	... ...
Gen. Elec. Pref.	1	6¾	6¾	24/-	—	5 8 4
do. Ord.	1	7½	7½	33 6	—6d.	4 7 0
Henley	1	20	25	102/6	—	4 17 8
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	—	18.9	—	... ...
Johnson & Phillips	1	17½	12½	51/9	+2/6	4 15 10
Met.-Vickers Ord.	1	8	8	30/-	—	5 6 8
do. Pref.	2	8	8	2⅝	—	6 4 8
Siemens Ord.	1	7	7½	30/-	—	5 0 0
Telegraph Construction	12	10	10	24½	—	*5 0 0

* Dividends paid free of Income Tax.

Electrical Exports of the United States.

Figures for 1925 and 1926 Compared.

THE following figures, showing the exports of electrical machinery and apparatus from the United States and the principal countries of destination in 1926, are taken from the recently-issued annual statistics of American trade. The comparative figures for 1925 have been added and notes of any increases or decreases given.

According to the official statistics the total values in thousands of dollars of the exports of electrical machinery and apparatus since 1922 have been as follows:—1922, 53,147; 1923, 59,927; 1924, 69,828; 1925, 73,790; 1926, 84,226.

Insulated wires and cables, although shown below, are not classed in the United States statistics as electrical goods.

	1925. Thous. $	1926. Thous. $	Inc. or dec. Thous. $
Generators, d.c., under 500 kW—			
Total	848	960	+ 112
To France	57	21	− 36
,, Canada	217	298	+ 81
,, Mexico	95	89	− 6
,, Colombia	33	36	+ 3
,, Venezuela	25	43	+ 18
,, China	5	12	+ 7
,, Japan	11	19	+ 8
,, Australia	27	76	+ 49
,, Cuba	64	34	− 30
,, Brazil	34	64	+ 30
Generators, d.c., 500 kW and over—			
Total	428	455	+ 27
To Spain	71	—	− 71
,, Canada	25	82	+ 57
,, Cuba	97	10	− 87
,, Brazil	82	12	− 70
,, Chile	—	126	+ 126
,, Japan	54	123	+ 69
,, Nicaragua	—	14	+ 14
,, Mexico	66	11	− 55
,, Argentina	15	14	− 1
Generators, a.c., under 2,000 kVA—			
Total	303	188	− 115
To Canada	31	30	− 1
,, Mexico	26	33	+ 7
,, British South Africa	5	8	+ 3
,, Colombia	4	12	+ 8
,, Cuba	37	2	− 35
,, Philippine Islands	—	9	+ 9
Generators, a.c., 2,000 kVA and over—			
Total	1,901	1,273	− 628
To Spain	92	80	− 12
,, Mexico	68	39	− 29
,, Cuba	78	—	− 78
,, Brazil	177	141	− 36
,, China	14	—	− 14
,, Japan	1,437	604	− 833
,, India	22	41	+ 19
,, Chile	—	352	+ 352
Steam turbine generator sets—			
Total	795	920	+ 125
To Mexico	88	125	+ 37
,, Cuba	120	108	− 12
,, Japan	437	355	− 82
,, Brazil	44	13	− 31
,, Canada	18	111	+ 93
,, Chile	6	224	+ 218
,, Java	2	94	+ 92
Self-contained lighting outfits—			
Total	1,076	1,151	− 75
To Spain	10	13	+ 3
,, Great Britain	128	128	—
,, Mexico	54	25	− 29
,, Argentina	146	158	+ 12
,, Colombia	14	21	+ 7
,, Cuba	55	5	− 50
,, Uruguay	61	30	− 31
,, India	17	25	+ 8
,, Australia	180	159	− 21
,, British South Africa	83	106	+ 23
Power transformers—			
Total	2,175	2,231	+ 56
To Cuba	238	40	− 198
,, France	5	—	− 5
,, Canada	52	11	− 41
,, Mexico	154	176	+ 22
,, Brazil	222	191	− 31
,, Chile	138	400	+ 262
,, India	90	128	+ 38
,, China	21	5	− 16
,, Japan	624	888	+ 264
,, Australia	181	48	− 133
,, Spain	178	5	− 173
Other transformers—			
Total	1,315	1,266	− 49
Accessories and parts for generators—			
Total	1,089	920	− 169
Rectifiers, double current, and motor generators, dynamotors, synchronous and other convertors—			
Total	967	1,557	+ 590
To France	50	50	—
,, Great Britain	56	37	− 19
,, Canada	185	220	+ 35
,, Mexico	32	41	+ 9
,, Chile	59	318	+ 259
,, India	15	36	+ 21
,, Japan	73	313	+ 240
,, Australia	75	144	+ 69
,, Spain	21	21	—
,, Brazil	28	75	+ 47
Switchboard panels, except telephone—			
Total	2,305	2,193	− 112
Switches and circuit breakers over 10 amp.—			
Total	2,424	2,618	+ 194
Fuses and fuse blocks—			
Total	343	352	+ 9
Watt-hour and other measuring instruments—			
Total	447	493	+ 46
To Canada	58	61	+ 3
,, Mexico	71	57	− 14
,, Cuba	70	22	− 48
,, Brazil	119	162	+ 43
,, China	11	33	+ 22
,, Japan	23	21	− 2
,, Australia	13	15	+ 2
Volt-, watt-, and ampere-meters, and other recording, &c., apparatus—			
Total	1,696	2,152	+ 456
Lightning arrestors, choke coils, &c.—			
Total	707	709	+ 2
Motors, under 1 h.p.—			
Total	2,102	2,000	− 102
To Holland	38	20	− 18
,, Spain	41	52	− 11
,, Great Britain	399	361	− 38
,, New Zealand	53	72	+ 19
,, Canada	572	634	+ 62
,, Mexico	38	44	+ 6
,, Argentina	77	88	+ 11
,, Japan	100	107	+ 7
,, Australia	132	162	+ 30
Stationary motors, 1 to 200 h.p.—			
Total	2,472	3,207	+ 735
To Spain	193	69	− 124
,, Great Britain	51	132	+ 81
,, Canada	578	611	+ 33
,, Mexico	248	220	− 28
,, Cuba	195	137	− 58
,, Brazil	69	84	+ 15
,, Chile	105	295	+ 190
,, China	26	28	+ 2
,, Japan	118	113	− 5
,, Australia	132	186	+ 54
,, British South Africa	47	97	+ 50
,, Argentina	67	513	+ 446
Motors, over 200 h.p.—			
Total	604	884	+ 280
To Canada	58	60	+ 2
,, Mexico	35	47	+ 12
,, Chile	98	244	+ 146
,, Japan	49	128	+ 79
,, British South Africa	9	10	+ 1
,, France	65	10	− 55
,, Spain	86	40	− 46
Railway motors—			
Total	808	1,126	+ 318
To Canada	32	13	− 19
,, Cuba	—	95	+ 95
,, Spain	151	49	− 102
,, Mexico	32	4	− 28
,, Brazil	23	76	+ 53
,, Chile	5	66	+ 61
,, Japan	355	175	− 180
,, Australia	66	246	+ 180
,, British South Africa	3	66	+ 63

	1925. Thous. $	1926. Thous. $	Inc. or dec. Thous. $
Starting and controlling equipment—			
Totals—			
For industrial motors ...	1,159	1,395	+ 236
For electric railway and vehicle motors	278	203	− 75
Accessories and parts for motors—			
Total	2,040	2,181	+ 141
Railway signals, switches, and attachments—			
Total	803	505	− 298
To Canada	154	191	+ 37
„ Japan	99	42	− 57
„ India	10	41	+ 31
„ Chile	107	5	− 102
„ Australia	149	86	− 63
Insulating material—			
Total	1,545	1,380	− 165
To France	60	67	+ 7
„ Great Britain	426	371	− 55
„ Canada	272	273	+ 1
„ Japan	129	286	+ 157
„ Australia	84	57	− 27
Fans—			
Total	917	948	+ 31
To Canada	53	76	+ 23
„ Argentina	143	203	+ 60
„ China	99	119	+ 20
„ British India	60	74	+ 14
„ Australia	57	56	− 1
„ Cuba	113	50	− 63
„ Mexico	61	45	− 16
„ Great Britain	24	31	+ 7
„ Japan	35	52	+ 17
„ Hong-Kong	106	45	− 61
Heating and cooking apparatus—			
Total	1,340	1,722	+ 382
To Great Britain	196	271	+ 75
„ Canada	254	289	+ 35
„ Japan	36	62	+ 26
„ Argentina	72	138	+ 66
„ Australia	214	327	+ 113
„ Mexico	89	85	− 4
„ Brazil	25	58	+ 33
„ New Zealand	130	150	+ 20
Motor-driven household devices —			
Total	1,206	1,744	+ 538
To Holland	120	86	− 34
„ Great Britain	404	580	+ 176
„ Canada	208	255	+ 47
„ Japan	21	18	− 3
„ Australia	132	336	+ 204
„ New Zealand	34	80	+ 46
„ Belgium	42	39	− 3
Industrial electric furnaces and ovens—			
Total	252	253	+ 1
Metal filament lamps—			
Total	1,250	1,603	+ 353
To Canada	23	16	− 7
„ Peru	23	25	+ 2
„ Mexico	274	267	− 7
„ Cuba	196	185	− 11
„ Argentina	128	205	+ 77
„ Brazil	21	44	+ 23
„ Australia	118	188	+ 70
„ British South Africa ...	26	44	+ 18
„ Chile	55	116	+ 61
Magnetos, sparking plugs, &c.—			
Total	2,708	1,904	− 804
To Italy	193	102	− 91
„ Great Britain	641	117	− 524
„ Canada	516	588	+ 72
„ Argentina	102	81	− 21
„ India	30	32	+ 2
„ Japan	95	122	+ 27
„ Australia	56	61	+ 5
„ New Zealand	20	16	− 4
„ British South Africa ...	14	15	+ 1
„ Mexico	32	29	− 3
Insulated wire and cable, copper—			
Total	4,900	4,816	− 84
To Great Britain	617	358	− 259
„ Canada	543	565	+ 22
„ Mexico	488	479	− 9
„ Cuba	824	602	− 222
„ Brazil	438	314	− 124
„ Chile	211	678	+ 467
„ China	198	56	− 142
„ Japan	41	31	− 10
„ Philippine Islands	169	171	+ 2
„ Australia	162	126	− 36
„ Colombia	117	144	+ 27
„ New Zealand	80	45	− 35
Insulated wire and cable, iron or steel—			
Total	268	276	+ 8
To Canada	10	23	+ 13
„ Mexico	47	39	− 8
„ Cuba	34	19	− 15
„ Brazil	19	12	− 7
„ Japan	8	9	+ 1
„ Venezuela	9	36	+ 27
„ Philippine Islands	18	5	− 13
Batteries, flashlight—			
Total	1,214	1,674	+ 460
To Mexico	134	148	+ 14
„ Argentina	189	169	− 20
„ India	185	307	+ 122
„ Philippine Islands	153	202	+ 49
Batteries, other primary—			
Total	1,203	2,020	+ 817
To Norway	16	18	+ 2
„ Great Britain	117	93	− 24
„ Canada	18	90	+ 72
„ Argentina	214	512	+ 298
„ Chile	39	35	− 4
„ China	20	54	+ 34
„ Australia	168	411	+ 243
„ New Zealand	40	95	+ 55
„ British India	23	34	+ 11
„ Brazil	78	85	+ 7
„ Mexico	110	121	+ 11
„ Spain	8	13	+ 5
Batteries, storage—			
Total	2,683	3,443	+ 760
To Denmark	59	36	− 23
„ Great Britain	163	159	− 4
„ Canada	213	293	+ 80
„ Mexico	159	149	− 10
„ Argentina	403	406	+ 3
„ Brazil	181	182	+ 1
„ India	101	177	+ 76
„ Australia	272	453	+ 181
Metal conduit, outlet and switch boxes—			
Total	797	1,164	+ 367
Telegraph apparatus—			
Total	497	1,018	+ 521
To Great Britain	55	218	+ 163
„ Cuba	14	38	+ 24
„ Canada	127	223	+ 96
„ Japan	43	43	—
„ Argentina	6	6	—
„ Newfoundland	2	91	+ 89
„ Germany	—	88	+ 88
Radio apparatus—			
Total	9,904	8,795	−1,109

The Marking of Imported Cables.

Merchandise Marks Act Inquiry.

As mentioned in our last issue, the inquiry by the Board of Trade Standing Committee into the application by the Cable Makers' Association for an Order in Council under the Merchandise Marks Act, requiring that imported electric cables and wires should bear an indication of the country of origin, was concluded on December 19th.

Mr. N. D. Watsham (Watsham's, Ltd.), continuing his evidence, said that he had ascertained that certain markings suggested by the applicants were already covered by patents. If the importers had to adopt such markings, therefore, they would have to pay royalties, which would further increase the cost of the cables.

Mr. R. Moritz, K.C. (for the applicants) pointed out that it was only necessary to avoid any specific modifications which had been patented.

The Chairman said that if, on the general evidence, the Committee decided to recommend an Order, it would confer with the Patent Office on the subject.

Mr. J. W. Dow (managing director, Armorduct Cable Co., Ltd.) gave evidence with regard to cables and wires, such as were used for internal wiring, and said he had never known wholesalers or contractors being unable to distinguish between British and foreign cables. Replying to the Chairman, witness said that if a wholesaler or a contractor bought from the Armorduct Co., he knew quite well that the cable he bought was Continental. If a contractor bought from a wholesaler, however, the price of the Continental was sufficiently far below that of the British to indicate that it was foreign. The cost of inserting tapes in flexibles might be 10 or 15 per cent. of the present total costs of the flexibles.

In the case of silk flexibles the *ad valorem* duty of 33⅓ per cent. would be charged also on the tape. Therefore, the marking of silk-covered flex would increase the price by 15 per cent. The use of a tape longitudinally along a cable would introduce risk of damage by moisture, and reduce flexibility. The stamping or embossing of a cable on its outside surface was not practicable. If the label were attached to a coil by means of a piece of wire round the coil, there was a risk that that wire would damage the insulation.

Counsel for the applicants produced a copy of a label used by the Armorduct Manufacturing Co., Ltd., of London, in which it was stated that the company made cables to the C.M.A. formulæ. That, he said, was a representation that the company carried on the manufacturing business in London.

Witness replied that the old manufacturing company had been wound up, and the phrase referred to was not used by the present company, which was not connected with the old one. Witness disagreed with counsel's suggestion that 95 per cent. of the small cables used in this country were already taped. The patents covering tough-rubber cables expired six months ago, and the sales of those cables were increasing, whilst the sales of v.i.r. cables were decreasing.

Mr. C. C. STRONG (representing the Metropolitan Electric Cable & Construction Co., Ltd.) asked witness whether the difference between the price of the cable produced by the Metropolitan Co. and the price of similar Continental cable was sufficient to indicate to the everyday purchaser that the one was British and the other foreign. Witness disputed the accuracy of the figures given for the British cable.

Mr. J. BARRETT (Messrs. Barrett & Wright, electrical contractors) said that his firm seldom bought foreign cable, but when they did so they were never in any doubt as to its origin.

Mr. F. C. BARNETT (managing director, Wholesale Fittings, Ltd., and president of the Electrical Wholesalers' Federation) gave evidence with regard to the conditions under which the cables were factored in this country, stating that he was speaking on behalf of his firm and not on behalf of the Federation. His firm dealt in both British and foreign electrical fittings, and all the cables sold by them bore the labels of the manufacturers. Continental cables were cheaper than British by from 30 to 33 per cent. Replying to Mr. Moritz, he said that 53 of the members of the E.W.F. were free to buy cables from both British and foreign manufacturers.

Mr. W. J. BENSLEY (Sloan Electrical Co., Ltd.) corroborated Mr. Barnett's evidence, stating that there was a vast difference in the prices of Continental and British cable.

Mr. E. J. HOGAN (managing director, Electric Cables, Ltd.) gave evidence with regard to the smaller types of cables, and said that it would be a commercial hardship, amounting to prohibition, if a tape were ordered to be inserted in cases where the construction did not otherwise demand it. The electrical contractor or wholesaler could distinguish foreign from British cables by experience. Further, C.M.A. cables were sold at a fixed price, whereas Continental prices varied according to market conditions, and were very much below British prices. The proposed method of marking coils of insulated wire would be irksome, and would entail extra unnecessary costs, and would also tend to damage the insulation of the coiled wire. The opponents feared that the proposals could only have been made from a desire to hamper the trade in imported wire.

As to the suggestion that the ratepayers in the various districts were not aware that their Councils were using foreign cable, witness produced cuttings from local newspapers at Cardiff, Salford, and Harrogate to show that tenders were invited from both foreign and English manufacturers, and that the Councils knew the origin of the cables used. Further, the newspapers reported the proceedings of the Council.

Mr. MORITZ, in his final address to the Committee, pointed out that over 50 members of the Electrical Wholesalers' Federation, out of 74, were free to deal with foreign goods, and were not bound to buy only from C.M.A. members, but the Committee had not been told how many of them were appearing in support of the opposition. Not one of the makers of the foreign cables had been brought over here to speak of the technical difficulties which, it had been said, the proposed marking would entail. The case of cables imported into Australia and New Zealand, as well as the evidence given, showed that it could be done. The cost was negligible, except in the case of the smallest of the v.i.r. cable used, and in that case the cost of inserting a tape would be only 2½ per cent. of the total cost. In the case of cables imported by reputable firms, the Customs authorities would probably examine one drum out of every 50. The bulk of the trade asked for the Order, and an Order would not affect the re-export trade, because there was no such trade carried on.

Mr. B. FARADAY (on behalf of the Independent Cable Makers' Association) drew attention to an admission by one of the opposition witnesses, to the effect that when he was asked for a "non-Association" cable he automatically gave his customers a Continental one. That seemed to be an additional reason why foreign goods should be marked. Catalogues had been before the Committee in which it appeared that an attempt was made to deceive the purchaser.

Mr. C. C. STRONG (for the Metropolitan Electric Cable and Construction Co., Ltd.) asked the Committee to recommend particularly that the names of the foreign manufacturers should be branded on cable drums and not merely painted or stencilled.

Mr. N. L. MACASKIE (on behalf of the opponents) submitted that there was no case for a marking Order at all. The amount of importation annually represented not more and probably less, than 3.3 per cent. of the total home production, and he knew of no trade in this country which was in so favoured a position as the cable-making trade in that respect. It had been shown that 60 per cent. of the importation concerned the heavy underground cables, and it had been agreed that there was no confusion as to the origin of those cables, and no reasonable probability of confusion. With regard to the cotton and silk insulated and enamelled wires, he was quite content that the bobbins on which they were imported should be stamped, if the Committee came to the conclusion that the applicants had made out a case for an Order at all—and he submitted that there was no need for an Order. The evidence with regard to the smaller cables used for internal wiring also showed clearly that there was no difficulty in distinguishing their origin. Reverting to underground cables, he referred to a suggestion that these should have a stamped cap at each end, which must be renewed when the cable was cut, as was specified by the Postmaster-General in connection with cables used in the Post Office. If the applicants were prepared to abandon their previous proposals for marking, he (Mr. Macaskie) would be content with marking by means of a cap.

Mr. F. N. KEEN said the latter suggestion was merely an alternative, and the applicants left the matter in the hands of the Committee.

Mr. MACASKIE, referring to the coils of small cables used for internal wiring, asked why the applicants should not be content with a label affixed by means of a tape, as was already done by the importers, and also by the British manufacturers. If the application were a *bonâ-fide* one, the applicants would have asked for an effective marking rather than one which would merely create further difficulties for the importers.

Mr. KEEN said one reason was that tapes could be easily manipulated and joined up again afterwards; another was that a wire band was more distinctive.

This inquiry was concluded, and the Committee will report to the Board of Trade in due course.

The British Industries Fair, 1928.

Exhibitors at the White City.

WE recently published a list of exhibitors at the Birmingham Section of the 1928 British Industries Fair. Now we have received lists from the Department of Overseas Trade giving the names of exhibitors in the London Section. The lists probably do not include all firms who are showing electrical or allied products, as they deal only with the wireless section and the scientific, optical, and photographic section. We reproduce below the whole of the first list, and have included such firms from the other section as are likely to display electrical appliances :—

Artandia, Ltd.
Atkinson, C. Creswick.
Betax.
Bower Electric (1926), Ltd.
British Ebonite Co., Ltd.
British Radio Corporation.
Brown, S. G., Ltd.
Brownie Wireless Co. (of Great Britain), Ltd.
Buravox, Ltd.
Camden Engineering Co., Ltd.
Damard Lacquer Co., Ltd.
Dowsing Radiant Heat Co., Ltd.
Dyson, J.
Eastick, J. J., & Sons.
Elliott Bros. (London), Ltd.
Ever-Ready Co. (Great Britain), Ltd.
Ferranti, Ltd.
Formo Co.
Foster Instrument Co.
Fuller Accumulator Co. (1926), Ltd.
Gambrell Bros., Ltd.
Graham Amplion, Ltd.
Halcyon Wireless Co.
Harling, W. H.
Hart Accumulator Co., Ltd.
Houghton-Butcher (Great Britain), Ltd.
Hart, Collins, Ltd.
Indurite, Ltd.
Junit Mfg. Co., Ltd.
Laker, J. & J.
Lilley & Co.
Lissen, Ltd.
London Radio Mfg. Co.
M.P.A. Wireless.
Melhuish, C. D.
Mic Wireless Co.
Mullard Wireless Service Co., Ltd.
Pelhams, Ltd.
Portable Utilities Co., Ltd.
Quartz Oscillators, Ltd.
Read Radio, Ltd.
Ross, Ltd.
Selectors, Ltd.
Sharp, Cecil.
Siemens Bros. & Co., Ltd.
Smith & Ansell, Ltd.
Snow, T. F.
Spauldings, Ltd.
Stapleton, A. W.
Telegraph Condenser Co., Ltd.
Trelleborg Ebonite Works.
Truphonic Wireless Co.
Watmel Wireless Co.
Wet H.T. Battery Co.
Whittingham, Smith & Co.
Wright & Weaire, Ltd.

Electric Wiring Accessories.

A few examples of the many ingenious labour-saving fittings which have been introduced by the Walsall Co. for electric wiring work.

MIDST the rush of progress in what may be termed the "heavier" or more important electrical apparatus, it is well to reflect on what is being done in the development of the smaller and auxiliary appliances used on wiring work.

Practically speaking, every wiring job brings its own difficulties, the overcoming of which results in the introduction of some minor device, "gadget" or "what not," in many cases to be standardised for general use at a later date. The possibilities of introducing labour-saving accessories in wiring work, particularly in connection with conduit fittings, are inexhaustible, and the practicable ideas which can be drawn from the foreman or wireman on the job by the sympathetic listener are innumerable.

We recently had the opportunity to inspect a number of novel electric fittings which have been produced by the Walsall Hardware Manufacturing Co., Ltd., and we suggest that the following descriptive notes may prove useful to many of our readers.

The actual fixing of conduit is often a time-wasting process where the old methods of plugging for saddles or clips are rigidly adhered to, particularly where the fixing is to concrete ceilings, and there are many excellent fittings on the market which are designed to facilitate this work. The spacer-bar saddle shown in fig. 1 is an example; it requires only one fixing hole, and the countersunk slot in the backplate allows for considerable adjustment, a useful feature when it is desirable to avoid a piece of flint in the concrete. Grouting-in is always a laborious task, but where the Lewis-bolt feature and the saddle are combined, as in fig. 2, the work is less tedious and greatly reduced.

Fig. 1.—Spacer Bar Saddle.

Fig. 2.—Spiked Spacing Saddle.

Fig. 5.—Aerial Clamp.

Fig. 6.—Non-Earthing Socket.

Fig. 3.—Multiple Looping Box.

Fig. 4.—Tangent Switch Box.

Another point which seems to have been sadly neglected in the past is that of drawing in (or out) where the conduit is buried in concrete. The difficulties of drawing or attempting to draw half-a-dozen wires through a tee concealed below the surface are too well known. The multiple back outlet looping box shown in fig. 3 offers a solution to this difficulty, in that the wires through each outlet all travel in one direction. The fixing lugs for the direct mounting of the ceiling rose also result in considerable time saving.

One of the arts of which the efficient wireman is proud is that of pipe-setting, but a better job must result where the setting is avoided entirely. The introduction of the tangent-type switch box, fig. 4, has resulted in considerable reduction in labour costs in this connection. It is obvious that where the conduit is taken down the corner of a room or close up to a door frame, and so on, a double setting is avoided. Further, much advantage is gained by the wires entering at the side of the box, in that wire "fishing" is reduced and "knuckling" practically obviated.

Another important point in connection with conduit wiring is the method of connection of the conduit to the distribution box. It is often required for extension or repair purposes to dismantle the box, and where the old method of taking the conduit ends through the walls of the box and bushing them inside is employed, this generally means taking down some of the conduit as well, entailing perhaps many times more work than the actual repair job. An ingenious method of overcoming this difficulty is depicted in fig. 7. Instead of the conduit being taken through the wall, it is finished short of the box exterior and a sleeve is screwed on the end and butted to the box surface. A smooth-bore brass bush finishes the connection from inside the box, securely clamping the wall between the bush flange and the sleeve. With correct gauging the bush and the conduit should meet in the sleeve.

A class of work which has hitherto perhaps been outside the province of the wireman, and, indeed, most supply undertakings, is that of the small overhead supply service. It is not easy for the practical man who has been used to the heavier class of work to "get down" to the light stuff, and the reminder that the connection of a pair of rubber service leads to, say, a 14-s.w.g. overhead line, is vastly different from, and simpler than, the connection to a 0.2 sq. in. underground cable, may, perhaps, not be out of place. The introduction of a variety of aerial clamps has done much to simplify the problem, in each case a good mechanical connection proving to fulfil all that is required. Fig. 5 shows a useful clamp which can be used for up to a $\frac{3}{8}$-in. line and 19/.044 leads.

The question of providing a suitable connection for lead-covered lead-in wires is another problem which has in some cases proved not a little difficult. Fig. 8 shows a simple and cheap box suitable for this work. With the exception of the cover and the bar clamp at the bottom cable entry, the whole is a single casting, which, when a suitable joint is made and housed inside, is filled with bitumen. Down sloping side entrances are arranged for the leads from the overhead, and these are suitably bushed.

Fig. 7.—Conduit to Box Connection.

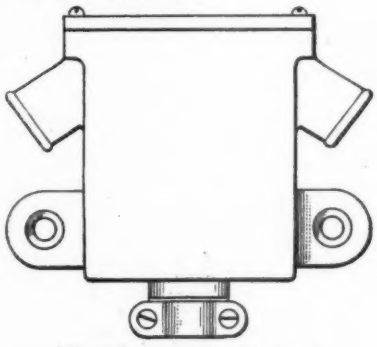


Fig. 8.—Overhead Lead-in Box.

An interesting "Walsall" product is a non-earthing socket and plug in which, it is claimed, a touch contact between any one socket and the metal housing is impossible. The sockets are buried deeply in a block of special vulcanite. The device is embodied in several types of fittings, including a combined ironclad switch plug. Fig. 6 shows a flush-type socket which is mounted in a suitable fixing flange.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A New Surface Condenser.

The Mirrlees-Delas-Ginabat surface condenser is being produced in this country by the MIRRLEES WATSON CO., LTD., 45, Scotland Street, Glasgow. It is the outcome of inventions by two French engineers, one by Engineer-Admiral Ginabat, of the French Navy, relating to the pitching of the tubes, and the other by Mr. Delas, of the Société des Condenseurs Delas, Paris, relating to the method of grouping the tubes.

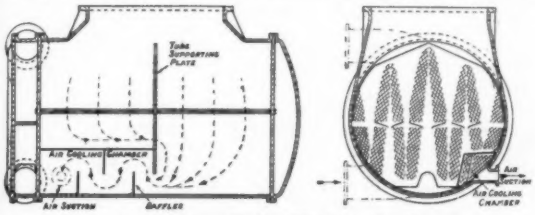


Fig. 1.—Mirrlees-Delas-Ginabat Condenser.

The tubes are arranged in shallow banks with very deep V-shaped openings for the steam entry, and so giving the maximum contact area. As the V openings are carried to the bottom of the condenser all the tubes are claimed to be equally effective. It will be seen that the condensate can be made to traverse a tube path into the inverted V space on the under side; in doing so it passes over a very small number of tubes, making contact with only a quarter of the circumference of each. Due to the small resistance offered to the steam and incondensable vapours, it is claimed that the kinetic energy is used in giving a compression effect to the gases at the bottom of the condenser and an increment of heat to the condensate; the compression effect is enhanced by the unrestricted fall of condensate through the inverted V-shaped openings. It is claimed that the heat transmission of the condenser is very much higher than anything previously recorded in practice. 1,000 B.th.u. having been attained in some installations. Fig. 1 shows the cross and longitudinal sections of the condenser and the special arrangement for cooling the air and reducing its volume before it passes to the air pump.

Switchgear Earthing Equipment.

Following along the lines recommended in the recently issued circular, "Danger from Live Electrical Conductors during Examination, Test and Repair," of the Mines Department (ELECTRICAL REVIEW, July 15th, 1927, p. 111), Messrs. A. REYROLLE & CO., LTD., Hebburn-on-Tyne, have introduced a method of earthing the conductors on pillar switchgear without the inconvenience of entirely removing the circuit breaker. Fig. 2 depicts the arrangement which has been adopted for the

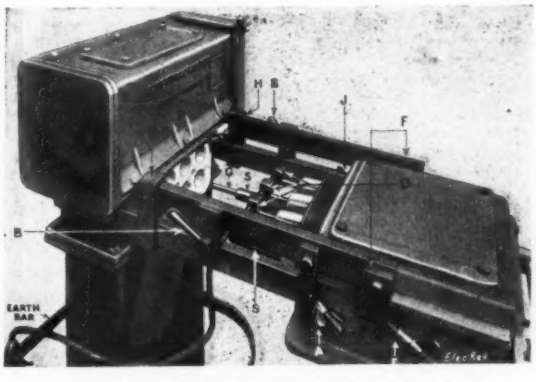


Fig. 2.—Switchgear Earthing Arrangement.

types "E" and "F" of the Reyrolle switchgear, but, if suitably modified, it can also be used on type "K" gear. The removable portion of the circuit-beaker is fully withdrawn, and special extension slide-bars, F, are fixed above the existing guide rails by means of the hook attachment H. The weight of the removable portion is then transferred to the extension slide-bars by means of cams operated by the handles B. The slide-bars are securely clamped by means of retaining nuts A attached to the ends of the original slide-bars. The stop J, which normally prevents overwithdrawal, is then swung out of position, and the removable portion of the circuit-breaker is withdrawn to the full distance allowed by the extension bars. The earthing cable is clamped to the earth-bar on the pillar and is then connected, by means of the special sockets D provided for the purpose, to the upper set of plug contacts on the removable portion, which under normal working conditions are connected to the bus-bars. Hinged earthing plugs G are then clamped by means of milled nuts to the plugs on the cable side of the removable portion of the circuit-breaker, and, to eliminate all possibility of accident, rubber sleeves, S, are drawn over the hinged metal parts of the extension plugs. To complete the operation, the removable portion of the circuit-breaker is plugged in by screwing up the wing nuts E until the limit of movement has been reached; the closing of the circuit-breaker then connects the cables to earth instead of to the bus-bars. When time and circumstances permit, it is advisable, as a preliminary, to connect a plug on one phase only, in order to minimise the effects of any inadvertent wrong connection. After the circuit has been found to be in order in this way, the remaining plugs may be connected to the other phases. To prevent operation of the circuit-breaker by unauthorised persons while work on the line is proceeding, the handle should be padlocked in the "ON" position by means of the special attachment supplied for the purpose

New Electric Water Heaters.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, is putting on the market a number of new electric water heaters incorporating some interesting features. Two sizes are made for local supply, one of 15 gal. capacity, 1,000 W,

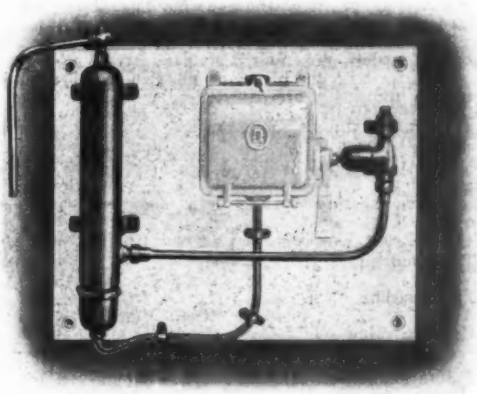


Fig. 3.—Electric Geyser Outfit.

for the bathroom, and a 6-gal. heater for supplying hand basins, sinks, and so on, 500 W. A heater of larger capacity, 30 gal., 2,000 W, is available for use where a general supply of hot water is required, at several points. The principal constructional features of these water heaters are: they are all double-cased, heavily lagged, and equipped with withdrawable immersion heaters; the thermostatic control does not rely on mercury switches, but it is of the contactor type; and all component parts standardised.

The "Magnet" electric geyser, fig. 3, has been designed primarily for use where small quantities of hot water are required by merely turning on the tap, and it should be eminently suitable for installation in dentists' and doctors' surgeries, and the like. With incoming cold water at a temperature of 50 deg. F. it will give, it is claimed, a continuous flow of nearly 1 pint of boiling water per minute and a continuous flow of 3 pints per minute at 95 deg. F. The geyser is fool-proof on account of its specially designed combined switch and water valve. The loading is 3,000 W.

A Wood-Preserving Process.

The "Cabra" process for preserving wood poles, an introduction of the BRITISH WOOD IMPREGNATING CO., LTD., 30, Norfolk Street, Strand, W.C.2, differs from other systems in that immersion of the timber in the preservative is not carried out. Instead, the preservative is injected into the cells of the wood by a special machine which weighs only a few pounds and can be easily carried and operated by one man. Only the vulnerable parts of the timber are treated, *i.e.*, near the ground level, thereby effecting a very considerable saving in the preservative. The preservative is in the form of a highly concentrated paste and is diffused through the timber by the action of the moisture in the wood. Important advantages claimed for the process are that no elaborate apparatus is required, poles may be treated while in the standing position, and spruce, which resists impregnation with creosote, may be treated.

Pulverised Fuel at Derby.

The Results of 15 Months' Operation: Test Figures, Maintenance and Upkeep Costs.

By G. H. LAKE, A.M.I.E.E.

(Extracts from Chairman's address before the EAST-MIDLANDS SUB-CENTRE *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

IN four years the evaporative capacity of steam-generating units has advanced from 60,000 lb. to 240,000 lb. per hour, whilst units of even greater capacity are being considered. In this country where mechanical stokers have held the field for so long, the size of the stoker has undoubtedly been the limiting factor in the capacity of the steam generator; but since the advent of powdered-fuel firing, manufacturers of mechanical stokers have improved their apparatus considerably, permitting boilers evaporating up to, and slightly exceeding 100,000 lb. per hour to be operated with stokers. The operating difficulties experienced when dealing with large evaporation with stoker-fired plant has led to a very keen survey of the possibilities of powdered-fuel equipment and, due entirely to the outstanding reliability of such equipment when in operation, this system of combustion is forging ahead very rapidly, not only in Great Britain, but also throughout the world. It seems safe to predict that we shall not have to wait long before boilers of upwards of 300,000 lb. evaporation per hour per boiler will have arrived in this country, and from my own daily experience in operation I can confidently state that such units will be manipulated with extreme ease, and at all times at high efficiency.

Our plant at Derby* has been in operation at least 15 months, but, although our original plant was only ordered in 1924 and completed in 1926, in the new extension now under construction the furnace design has been completely modified and now embraces the water cooling of three walls as well as the screen at the bottom. It is well to remember that in the modern stoker plant similar features are becoming a necessity, for with the higher combustion-chamber temperatures many difficulties are experienced with both stoker and arch, and maintenance has become a serious problem. The results of some remarkable experiments which have been carried out in a large industrial works in Lancashire serve to emphasise the fact that boiler design may, in the very near future, undergo radical alteration, by bringing the whole of the effective heating surface into one large combustion chamber.

TABLE I.—*Coal Analysis and Grading.*

Total moisture	8.18 per cent.
Volatiles	26.33 ,, ,,
Fixed carbon	43.65 ,, ,,
Ash	22.07 ,, ,,
Calorific value	10,009 B.th.u.

TABLE II.—*Boiler Trail (General Data).*

Total duration of test	100 hrs. 33 mins.
Total water evaporated	4.016.561 lb.
Total coal burnt	635,939 lb.
Average flue-gas temperature (outlet)	269.6 deg. F.
Water evaporated per lb. of fuel	6.316 lb.
Average steam pressure	313.43 lb./sq. in.
Average steam temperature	722 deg. F.
Calorific value of fuel as fired	9.930 B.th.u.
Efficiency of boiler	83.58 per cent.

TABLE III.—*Results of 8-hour Test.*

Coal consumed	59,750 lb.
Water evaporated	446,500 lb.
Feed water (inlet)	121.17 deg. F.
Feed water (outlet)	298.47 deg. F.
Average CO_2	13.5 per cent.
Average final exit gas temperature	308 deg. F.
Average final steam temperature	713 deg. F.
Average steam pressure	296 lb. gauge.

$$\text{Efficiency} = \frac{7.5 \times 1{,}375.7 - 89.17}{10.900} \times 100 = 83.45 \text{ per cent.}$$

There has been no difficulty at any time in obtaining adequate supplies of the poorer grade of fuel at an average price 50 per cent. cheaper than the coal purchased for our existing stoker-fired plant. This fact is an important one, for in connection with maintenance costs it is necessary to remember that we are pulverising coal with a high percentage of ash; we are quite alive to the fact that in this respect we have subjected our plant to the severest conditions, and in our case the balance sheet is well on the right side. The raw coal now being consumed by our "Lopulco" plant is regularly graded and the figures supplied by the West Ham Testing Laboratory denote that our raw coal all passes a 3/16-in. mesh. An analysis of a sample of pulverised fuel taken during a recent test was as shown in Table I. In our original plant we started with one "Lopulco" steam dryer, one of the first of an entirely new design, which has now completed a run of fourteen months. In our latest extension a new type of dryer has been installed which embodies several improvements as the result of the experience gained in operation: the machine has sixteen tiers of coal-carrying plates, each tier consisting of one plate, instead of ten separate plates as in the original dryer; concentric rings of steam heating coils are cast in the plates on which the coal is placed by means of a new design of feeder, consisting of a star wheel which deposits a regular stream and definite amount of coal on to the top plate. The coal is spread in an uniform layer over the plate, and after making almost a complete revolution is scraped off into a chute which directs it on to the second plate, this process being continued with each successive plate until the coal is finally discharged through the bottom of the dryer. Another advantage of the new dryer is the fact that there are only 64 steam joints, all of the flange type and easily accessible.

TABLE IV.—*24-hour Boiler Trial Test.*

Duration of test	24 hours.
Total water evaporated	1,262,000 lb.
Total coal burnt	189,600 lb.
Average flue gas temperature (outlet)	290.6 deg. F.
Water evaporated per lb. of fuel	6.656 lb.
Average steam pressure	315 lb./in.² abs.
Average steam temperature	699.7 deg. F.
Calorific value of fuel as fired	10,009 B.th.u. per lb.
Percentage efficiency of boiler	84.33 per cent.
General Data.	
Total energy generated by turbine	103,850 kWh
Total coal consumed	189,600 lb.
Coal per kWh generated	1.826 lb.
Calorific value of fuel	10,009 B.th.u. per lb.
B.th.u. per kWh generated	18,276
Thermal efficiency	18.68 per cent.
Auxiliaries.	
Total kWh for turbine auxiliaries	2,720
kWh per ton for pulverising, conveying, &c.	24.5
kWh per ton for fan equipment	21.0
Average steam consumption per kWh generated	10.158 lb.
Summary of Test.	
kWh generated by turbine	103,850
kWh for turbine auxiliaries	2,720
kWh for boiler-house auxiliaries	3,850
kWh generated to feeders	97,280
Fuel consumed	189.600 lb.
Fuel per kWh to feeders	1.949 lb.
Calorific value of fuel	10,009 B.th.u. per lb.
B.th.u. per kWh to feeders	19,507
Load factor	43.25 per cent.

TABLE V.—*Maintenance Costs.*

	£	s.	d.
Firebricks	50	0	0
Safety links	3	10	0
Screw conveyor materials	11	10	0
Ball races	3	0	0
Carrier plates for dryers	9	0	0
Tippler plates for dryers	8	0	0
Ball race for dryers	7	0	0
Exhauster impeller	20	0	0
Steam glands for dryer	14	0	0
Lubricators (screw conveyor)	1	0	0
Exhauster impeller blades	3	2	6
Ditto	3	2	6
Ditto	4	13	9
Mill rollers, 1 set	48	0	0
Breaking links	1	1	6
Coal feeder screws	7	9	0
Coal piping, 1 set	64	17	3
Ball races, 2 sets	5	17	0
Ball races, 1 set	2	18	6
Lubricators for conveyors	1	13	0
Dryer pegs and special washers	0	16	0
Dryer bevel pinions	10	11	6
Mill ploughs, 1 set	11	7	3
Piping, 1 set (cyclones to mills)	79	13	0
Holding tiles, partition plates clips, &c., for furnace modification	164	11	0
Firebricks for ditto	98	5	0
Refractory cement	9	16	0
Skilled labour	77	0	0
Unskilled labour	113	12	0
Total	£835	6	9

* For the description of the generating station see ELEC. REV., November 5th, 1926.

Figures obtained by Mr. W. M. Selvey (see Tables II and III) were very good and that "snap" test gave us considerable encouragement. A year after the plant had passed fully into our own control, the glamour of the new thing having departed, we sought to ascertain exactly where we stood. Consequently, on September 5th, 1927, I instructed my staff to conduct a complete test for a period of 24 hours, and Table IV shows what we found.

The first twelve months of operation terminated on June 30th, 1927: from an inspection of the plant at the end of that period it was decided to carry on with the powdered-fuel boilers until August, 1927, when (owing to the majority of works being closed down in Derby) we could spare both of our boilers off the line and conduct our annual survey and overhaul. Therefore, we have embraced in our records the full period of 14 months of operation in order that the repairs carried out during the survey period should appear in our first statement of operating costs.

We have during our first 14 months consumed 25,000 tons of coal, of which amount 12,000 tons was pulverised on our No. 2 mill, when it became necessary to change the six rollers, and the balance of 13,000 tons has been pulverised on the No. 1 mill without renewals during this period.

Table V is a record of material purchased and labour costs, which figures include the cost of modifying the holding tiles of one of the combustion chambers, the whole of the boiler-house repairs, and the details customary to the Insurance Company's survey of the boilers, which gained a clean certificate.

The total cost of renewals (200,481d.) divided by the coal consumed (25,000 tons) equals 8.02d. per ton, which figure is the crux of the whole situation, covering every detail connected with boiler-house repair. Therefore, considering the cost at which we buy our fuel, and the fact that even if our maintenance cost of pulverising only reached 1s. per ton we could still realise important savings, our present results show a remarkable state of efficiency.

There is no need to labour the point: our plant at Derby has been a complete success, and I am confident that with the latest improvements we are embodying in our future designs of plant it will be possible to improve upon the results which have already been obtained.

Recent Transformer Developments.

Some details of the B.T.H. apparatus built for the new Longford power station which is under construction at Coventry, and some comparative notes on recently produced 110,000-V potential transformers.

THE power transformers which have been constructed by the British Thomson-Houston Co., Ltd., for the Longford power station at present under construction for the Coventry Corporation, are of unusual interest in that they are claimed to be the largest self-cooled units which have been built in Great Britain, and have several important and new principles incorporated in their design. When installed, the transformers will be tied, in banks of three, without intervening switchgear, to the 6,600-V generators, and each bank will deliver 23,475 kVA at 0.8 p.f. to the 33,000-V bus-bars.

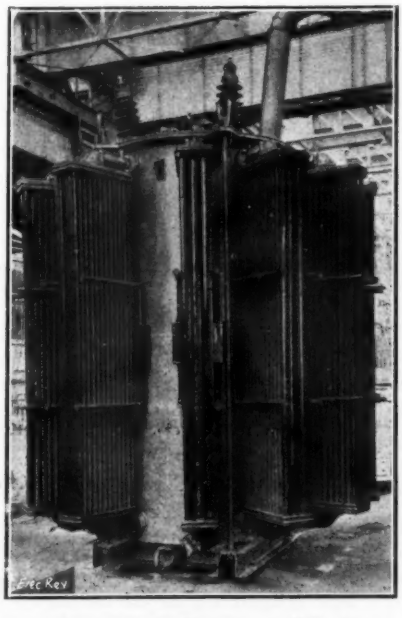


Fig. 1.—8,350-kVA Transformer, H.V. side.

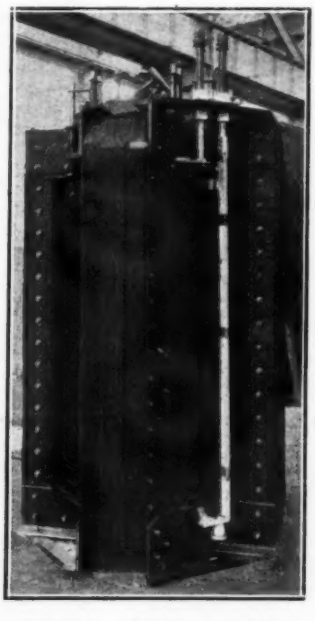


Fig. 2.—Assembled Core and Coils.

A general idea of the size and design of the single-phase transformers may be obtained from fig. 1, which shows the high-voltage side of one unit. The transformers are claimed to be the first to be manufactured in this country in which high-pressure-air jet cooling is employed. This feature enables an output of 8,350 kVA per single-phase unit to be given continuously by these particular transformers, the normal self-cooling rating under BSS 171 conditions being 6,700 kVA.

The winding arrangement is concentric and the coils are circular, every conductor in contact with the oil being supported by radial spacers, ensuring adequate support against mechanical forces without heat blanketing. The radial spacers embody the special B.T.-H. feature of being dovetailed with axial spacers, so that they are definitely locked in position in all directions, independently of coil pressure or varnish-cementing treatment. Each strand of the conductors is insulated with a pretreated paper tape, after careful cleaning to remove all slivers, oxide scale, and so on. After winding, each coil is separately shrunk and then given a "vacuum varnish impregnation." The low-pressure voltage winding is a single-layer coil of one turn per section, while the high-voltage winding has several turns per section, and is wound continuously without a joint. Each winding is transposed to ensure equalisation of the current through all the strands, and is wound in such a manner as to minimise mechanical forces and is magnetically centred over the core on assembly.

An illustration of the low-voltage winding is shown in fig. 3, and the high-voltage winding in fig. 4. It may be noted that the coil leads are carefully re-grouped and positively located by being brought out through end rings. The latter are made of insulating material and are designed for the mechanical stresses exerted on the occasion of heavy fault currents.

The construction is claimed to favour a comparatively low ratio of copper to core losses, giving a high overload capacity and maximum efficiency at the self-cooling rating, these being desirable requirements for a "base load" power station. The whole design is compact: the small floor space is, of course, important in a station lay-out, and also the low height of the core and coils from the transport point of view. The core construction is simple and symmetrical; it gives exceptionally good oil circulation through both the windings, and uniform coil support and clamping, with a minimum span between the supports. An exceptionally large amount of edge surface is exposed to the oil, and thus eliminates hot spots in the core. A manufacturing advantage is that it gives a minimum width of end sheets, so facilitating the interleaving of the yoke.

The leads of both windings are rigidly supported, but between them and the porcelain terminals in the cover are flexible links to ensure that no mechanical strains are set up by the normal thermal expansion under load of any part. A view of the core and coils is given in fig. 2.

The tanks are of electrically welded steel plate, and the radiators are made detachable in order to facilitate transport. At the top and bottom of each radiator, between it and the tank, is a special oil valve which permits the core and coils to be dispatched under oil in the tank after being dried out at the works, thus avoiding lengthy and expensive operations on site.

The provision of two valves renders it unnecessary to remove any oil from the main tank before fitting a radiator, and for the winding to be out of oil at any time during erection. A 1-in. sampling valve is provided at the bottom of the tank, and

this can be used in connection with a similar valve at the top and a portable centrifuge to filter the oil. A drain valve, a dial thermometer, and draw eyes are also fitted, and an oil conservator is provided for each bank.

It is interesting to learn that the B.T.-H. Co. has received an order for some still larger self-cooled units (11,333 kVA).

Fig. 5 shows one of a batch of 110,000-V potential transformers which have recently been manufactured by the B.T.-H. Co. for duty overseas. In our issue of July 10th, 1925, p. 76, we described and illustrated a similar transformer

Fig. 3.—L.P. Coil Stack.

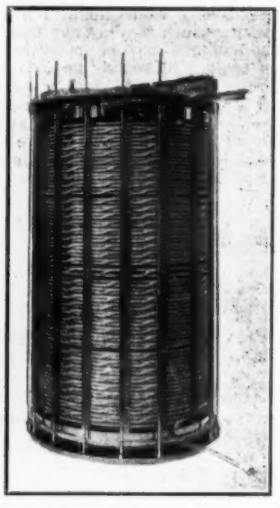


Fig. 4.—H.P. Coil Stack.

which was claimed to be the first to be built in this country for working on the pressure named, and it is interesting to compare the old and new apparatus.

Although the new transformer is intended for use on a system with a solidly earthed neutral, so that only one high-voltage bushing has to be provided, the line-end insulation to earth is suitable for the same test as was the older transformer *viz.*, 221,000 volts at 50 cycles for one minute. The floor space occupied has been reduced to 77 per cent. of that of the initial apparatus, the height to the tank cover to 56 per cent., and over the bushings to 74 per cent.; the quantity of oil required is only 25 per cent. of that previously necessary, and the total weight is 39 per cent. of the original.

The actual figures for the old and new apparatus are as follows, the bracketed figures indicating the dimensions for

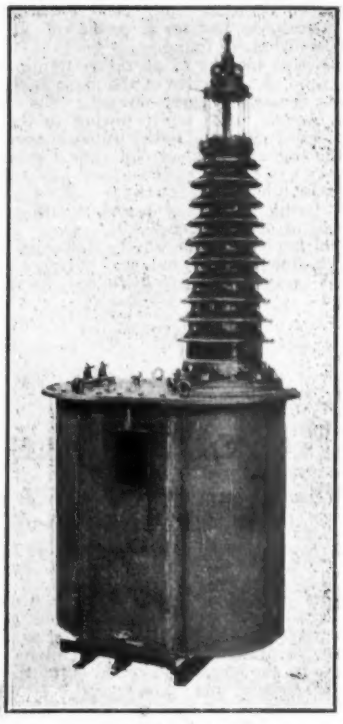


Fig. 5.—110,000-V Potential Transformer.

the latter:—Floor space, 5 ft. by 4 ft. 3 in. (4 ft. 2 in. by 3 ft. in.); height to tank cover, 7 ft. 2 in. (4 ft.); height over bushing, 12 ft. 6 in. (9 ft. 3¼ in.); quantity of oil, 600 gal. (150 gal.); total weight, including oil, 9,000 lb (3,500 lb.).

Pulverised Fuel on Ships.

Some Particulars of the Powdered-Coal Equipment used on the S.S. "Mercer" during recent trials.

ONE of the much debated and perplexing problems of the present day to the supply engineer is that concerning the possibility of raising the station efficiency by the utilisation of pulverised fuel, and particularly its possible adaptation to the water-tube boiler. This alone renders the recent trial run of the s.s. *Mercer* from New York to Rotterdam of almost direct interest, in that she was equipped for pulverised-fuel firing in conjunction with Scotch marine boilers. Further, the proposition of substituting pulverised coal for oil on either land or sea is a matter of great importance to the coal industry in this country, and therefore, indirectly, to the electrical industry.

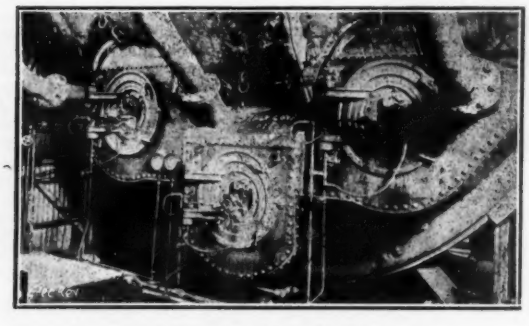


Fig. 1.—Boiler Front with Burners.

Some particulars, therefore, of the *Mercer* equipment may not be out of place, and the following are some notes taken from an article by Mr. Carl E. Jefferson and Commander Evans on the tests carried out on the equipment for the vessel in question, which appeared in a recent issue of the *Marine Journal*.

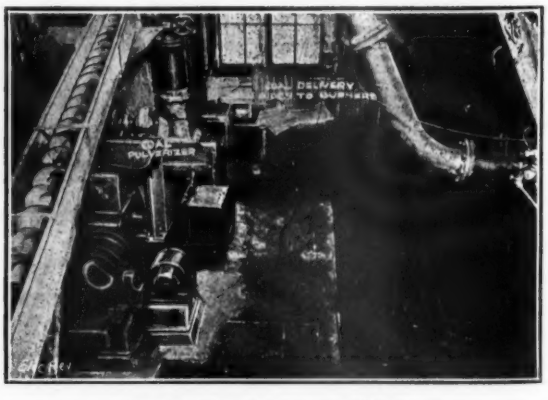


Fig. 2.—Boiler Front and Auxiliaries.

The mill selected for this purpose was the Kennedy air-

swept-tube type which has been used since then for other test work to date, including a 240-hour continuous service run. The third series of tests consisted of a number of short runs over a period of about six weeks. The boiler was a single-ended Scotch marine boiler having three furnaces with separate combustion chambers. A double front was also constructed on the boiler front for supplying preheated air to the burner air registers; these were integral with the burner front plates which were hinged to the exterior of the double front. The air registers thus could be swung outward toward the fireroom when the burners were not in use, to provide access to the furnaces. The furnaces were modified by installing a ring of refractory 18 in. long. The only other modification was to provide three holes in the rear of the boiler, each hole being, as nearly as possible, in line with the centre of each furnace. The burners used were of the Peabody combined fuel-oil and pulverised-coal type, fig. 3. The atomiser can be readily withdrawn when changing from oil to coal. The coal burner is composed of two principal parts—the air register and the coal box. The function of the air register is to regulate the admission of such air (in addition to that air which carries the pulverised coal) as may be necessary for complete combustion, and also to cause it to assume a rotary motion, so that, as it meets the stream of carrier air and its contained coal from the coal "register," the entire volume of air and coal is given increased turbulence, principally by rotation. Varying

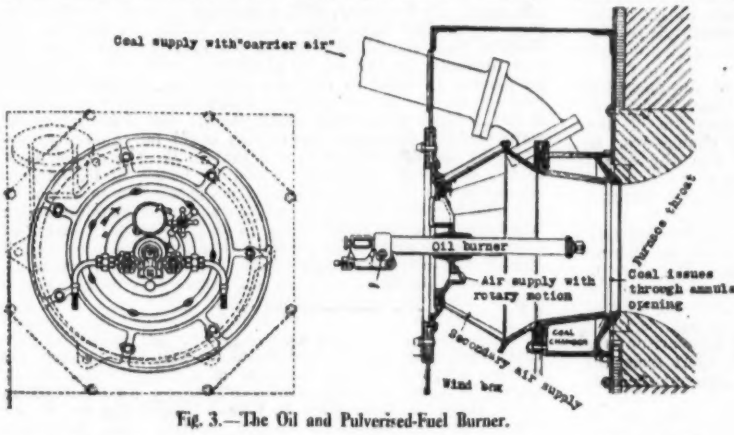


Fig. 3.—The Oil and Pulverised-Fuel Burner.

the opening of the air register is accomplished by means of a star wheel, which actuates the shutters by a rack and pinion device. An additional star wheel provides for locking the air register in any position.

The function of the "coal register" or coal distribution box is to distribute the pulverised coal uniformly around the burner. This register consists of a hollow casting in the form of an involute of rectangular cross-section, having in its inner surface, near the furnace end, a slot through which the coal stream enters the throat of the burner. This slot is sloped slightly towards the furnace end of the burner, and this sloping, together with the involute shape of the casting, gives the entering coal and carrier air stream a forward rotary motion which is augmented by the secondary air stream entering through and directed by the air register. Connection between the coal "register" and the coal feed line is made by means of a flanged pipe joint, the cross-section of the area through which the coal and carrier air stream passes gradually changing from circular at the flanged joint to rectangular along the involute.

The pulverising medium is a charge of "Herculite" steel balls; on the run the charge was 5.190 lb. Any depletion due to wearing of the balls can be made up simply by feeding additional balls into the feed end of the mill either while it is in operation or at rest.

The mill is driven by a steam turbine through a Poole speed-reducing unit, pinion and herring-bone gear wheel, the latter being bolted to and around the flange which connects the outer cylinder to the discharge head of the mill. At the feed end is a feed hopper and disk, the hopper being simply a conical-shaped bin which directs the entering coal stream on to the feeder disk, and the disk, a rotating circular steel plate on the top surface of which the feed hopper delivers the coal centrally. The coal spreads over the feeder disk in a conical pile, but is prevented from spilling off by a stationary sheet-metal guard which rises a few inches above the level of the upper surface of the feeder disk.

The speed of rotation of the feeder disk, and therefore the rate of feed to the mill, can also be varied, the disk being driven by a variable-speed ½-h.p. motor.

The coal used, the major part of which was semi-bituminous, was stored in an open bunker outside the fire-room, from which it was raised by a bucket conveyor to a "ready" bin or hopper. A metal screen was fitted on top of this bin, and such large lumps of coal as had not been broken before being conveyed to the top of the bin were broken on the screen, so that no pieces of greater dimension than about 3 inches entered the hopper. The coal was fed from the hopper through a regulating sliding gate to the weighing box, where the supply was weighed and passed to a screw conveyor which delivered the coal to the feed hopper of the mill.

Fig. 1 shows the front of the boiler with the burners fitted, and fig. 2 depicts the arrangement and disposition of the auxiliary equipment with the boiler front.

The Work of the Electricity Commissioners.

Annual Report.

THE seventh annual report of the Electricity Commissioners, for the period from April 1st, 1926, to March 31st, 1927, was issued last week (H.M. Stationery Office; price 3s. net). It opens with a summary of the provisions of the Electricity (Supply) Act of 1926, followed by a review of the progress of the electricity supply industry during the past seven years—*i.e.*, since the constitution of the Commission—a period marked by a rapid increase in the scope of operation of the industry, by the investment of large amounts of capital, by the development of the sale of electricity, and by reductions in costs and charges.

The Report of the Advisory Committee on Domestic Supplies of Electricity and Methods of Charge, which was presented to the Commissioners in July last year (ELECTRICAL REVIEW, October 29th, 1926, p. 730) is then reviewed, and its principal recommendations are summarised, with brief comments indicating the Commissioners' attitude towards them; many of them are commended to the consideration of authorised undertakers, and in some cases further legislation embodying the proposals is foreshadowed "at a convenient opportunity."

Generation and Consumption of Electricity.

The number of authorised undertakers in Great Britain on March 31st, 1927, was 624, including 2 Joint Electricity Authorities and 4 Joint Boards; 367 local authorities and 251 companies and persons held statutory powers. The energy generated by local authority undertakings during the year amounted to 4,574 million kWh, and by companies to 2,488 millions, a total of 7,062 millions; in addition, 623 million kWh was generated by railway companies, 358 millions by tramway authorities, and 322 millions by non-statutory undertakings—grand total, 8,366 million kWh. Coal and coke consumed amounted to 8,711,027 tons, and oil fuel to 145,911 tons. Thanks to the prolonged coal strike of 1926, the increase in output was less than 3 per cent., and owing to the inferior coal available the amount consumed increased by more than 3 per cent., whilst the amount of oil used was nearly quadrupled. Seven generating stations produced over 200 million kWh each, and 18 produced more than 100 millions each, accounting for 38.8 per cent. of the grand total. During the year 26 stations were closed and 12 opened. Less than one million units was generated at each of 252 stations, 44.3 per cent. of the total (570); and 418 stations (73.4 per cent.) generated less than 10 millions each—the remaining 152 stations producing 91.4 per cent. of the total output. The total amount of energy sold by authorised undertakers in Great Britain was 5,724 million kWh (local authorities, 3,697 millions; companies, 2,027 millions), showing an increase of 3.6 per cent. on the previous year.

Schemes for the Central Board.

Whilst the Act of 1926 admits of the preparation of one comprehensive scheme for the country as a whole, the Commissioners found it preferable to prepare a series of schemes relating to large regions, ultimately to form portions of a

consolidated nation-wide scheme, and decided to deal first with the industrial regions of Central Scotland and Central England, where large areas were supplied at the non-standard frequency of 25 cycles per second, and the important centres of population in South-East England, Yorkshire, and Lancashire. A curve of growth extending in the first place up to the year 1933-34, the date by which the Commissioners contemplate that the primary transmission system of the Central Board will have been completed in the majority of the regions, and thereafter up to the year 1940-41, was prepared and adopted for the purpose of determining the nature and extent of the provision to be covered by the various schemes. It then became necessary to undertake a detailed investigation of the position in the region immediately concerned, with the view of determining what generating stations should be selected stations, what other stations were likely to be required temporarily for the purposes of the scheme, and the most suitable layout of the transmission system for interconnecting the generating stations with one another and with the systems of authorised undertakers. To assist them on these matters, the Commissioners retained the professional services of outside electrical engineers. An analysis of the whole of the data was then necessary in order to determine which of the stations could deliver the cheapest energy, and to determine the location and extent of the further generating plant required for subsequent development. The ascertained resultant load curves for the region were then taken as a basis for the allocation of the generating requirements in the most economical manner between the stations contemplated for operation as three-shift (base load), two-shift, and one-shift stations, respectively.

For the purpose of estimating the results of the operation of the scheme it also became necessary to envisage a practical programme embracing the progressive construction of the system of interconnection and a progressive change-over to standard frequency (where necessary), and also the extent to which the various stations would require to be operated on account of the Central Board from year to year, whether as selected stations or under temporary arrangements.

On such bases, it was then necessary to make detailed estimates year by year in order to ascertain the cost to the Central Board of generation at the various stations; the cost to authorised undertakers of direct or indirect supplies from the Board, with due regard in the case of the owners of selected stations to the terms on which they are entitled to be supplied under the Act of 1926; and, for purposes of comparison, the costs on the basis of individual development apart from the scheme, assuming skilful development under present methods of generation and distribution.

The preparation of schemes with supporting particulars for the country as a whole will involve a large amount of investigation, and it appears probable that a period of at least two years may elapse before the work is completed.

London and Home Counties Electricity District.

The Joint Electricity Authority submitted an interim report on the technical scheme for the District, but the Commissioners concluded that the proposals would have to be carefully reviewed to ensure that they would accord with a scheme for a wider area under the new Act. A proposal to erect a new station at Chiswick was disapproved by the Minister of Health, but the Authority eventually obtained an Act authorising the construction of the station, subject to the consent of the Commissioners.

Progress was made towards settling the standard prices to be fixed by the London companies for the purposes of the sliding scales. The acquisition of certain generating stations and main transmission lines by the London Power Company, Ltd., was approved, and the time allowed for the four companies affected by the London Electricity Act No. 1 of 1925, to agree terms of amalgamation was extended to June 30th, and eventually to December 31st, 1927.

West-Midlands Electricity District.

Active steps were taken by the Joint Electricity Authority to centralise generation in the District, and the Commissioners consented to the acquisition of certain generating stations and main transmission lines.

Generating Stations.

The announcement of the policy of the Government with regard to the centralisation of generation, and the introduction of the Electricity (Supply) Bill in March, 1926, had no noticeable influence in causing a deferment of applications for consent to the establishment of new or the extension of existing generating stations. Apart from cases which were under consideration in March, 1926, the number of additional applications made during the past year was above the normal of the previous two years, upwards of 100 applications being received by the Commissioners, of which 85 related to extensions of existing stations. The proceedings on all applications relating to the proposed installation of further generating plant involved careful consideration of the position as affected by the provisions of the new legislation.

The aggregate capacity of the generating plant sanctioned by the Commissioners during the year amounted to 775,604 kW, a substantial increase on the figure of 585,700 kW recorded for the previous year. Local authorities received consent to the installation of plant of 491,103 kW, companies 213,611 kW, and railway and tramway authorities and non-statutory undertakings 70,890 kW.

Of the generating plant sanctioned during the past seven years, 709,210 kW, or 19.7 per cent., was for new stations, and 2,888,087 kW, or 80.3 per cent., for existing generating stations, divided as follows:—Local authority undertakers, upwards of 61 per cent.; company undertakers, about 31.4 per cent.; and railway and tramway authorities and non-statutory undertakings about 7.4 per cent. In a number of instances the installation of the new plant involved the displacement of other equipment of an obsolete type.

During the year the Commissioners issued 19 consents (11 to authorised undertakers and 8 to non-statutory undertakings) in respect of the establishment of new generating stations, representing the initial installation of plant having a total rated capacity of 236,100 kW. The five principal consents authorised the erection of new stations with initial capacities of over 30,000 kW in each case. In March, 1926, the Corporation of Birmingham made application for consent to the establishment on a site at Hams Hall of a new generating station to contain initially two 30,000-kW 25-cycle sets but capable of eventual extension to accommodate 210,000 kW of generating plant. After consideration of the position, the Commissioners in September, 1926, informed the Corporation that they were in a position to issue a consent which would enable the works to be proceeded with, but that they proposed to postpone their decision as to the frequency of the generating plant to be employed. In February, 1927, a deputation from the Corporation urged that immediate consent to the installation of 25-cycle plant should be given on the grounds that the necessary provision for the winter of 1928-29 could only be ensured by placing an order at once for such plant, preliminary preparation for the manufacture of which had been put in hand in anticipation of an order being placed; that if 50-cycle plant were decided upon, the contractors could not guarantee delivery by the time required; and that in the absence of proof that a change of frequency would be beneficial to the consumers in the Birmingham area, the Corporation could not be expected to await a decision on the question of standardisation which could not be forthcoming in time to ensure delivery of either 25-cycle or 50-cycle plant in time for the winter load of 1928-29. In all the circumstances, the Commissioners reluctantly came to the conclusion that there was no alternative but to allow the initial installation at Hams Hall to be proceeded with on the basis of 25-cycle plant; and formal consent to the installation of two 30,000-kW sets was issued on February 25th, 1927, on the understanding that the decision was without prejudice to any question of standardisation of frequency in connection with a scheme affecting the Birmingham area. Consents were given to Bristol Corporation for a new station at Portishead to contain initially two 20,000-kW 50-cycle sets; to Coventry Corporation, for a station at Longford to contain initially two 18,750-kW 50-cycle sets; to the North Metropolitan Power Station Company, Ltd., for a new station at Brimsdown to contain initially two 25,000-kW 50-cycle sets; and to the Lochaber Power Company for a station to contain initially five water-turbine direct-current sets each coupled to two generators having ratings of 3,000-3,400 kW, and two water-turbine alternator sets each having a rating of 1,200 kW.

In two cases, the Commissioners refused consent to the establishment of new generating stations. Barrow-in-Furness Corporation made application for consent to construct a hydro-electric station at Backbarrow having an installed capacity of 1,500 kW, but the Commissioners came to the conclusion that the circumstances did not justify the proposed expenditure. Middlesbrough Corporation applied for sanction to a new station having an installed capacity of 9,000 kW; negotiations had been carried out with the Cleveland and Durham Electric Power Company with a view to the extension of the existing bulk supply agreement between the parties, but the terms offered by the company were unacceptable. The proposed station was to be established within a short distance of the North Tees power station from which the bulk supply would have been given. A local inquiry was held, and the Commissioners came to the conclusion that the case for local generation had not been proved to their satisfaction, and in pursuance of their powers under Section 19 of the Act of 1919, required the Corporation and the Power Company to enter into and carry into effect an arrangement for mutual assistance.

Applications were under consideration from the Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Company to establish a new station in the neighbourhood of St. Neots, which was approved in principle; the Lancashire Electric Power Company, for a new station at Kearsley on the River Irwell, which was granted in June, 1927; Leeds Corporation, for a new station at Kirkstall, capable of eventual extension to accommodate 150,000 kW, which was granted in April, 1927; and London Power Company, Limited, for a new station on a riverside site at Battersea, with an ultimate capacity of 450,000 kVA, divided into six units of 75,000 kVA each, the initial section to comprise two such units with four boilers each having an evaporative capacity of 250,000 lb. per hour, which was granted in October, 1927.

At March 31st, 1927, work was in progress or completed on the construction of new generating stations at Barking, Brimsdown, Chadderton, Ferrybridge,* Hams Hall, Hartshead,* Longford, Padiham*, Portishead, and Stourport* [*in operation].

During the year, consents to the extension of existing generating stations were given by the Commissioners to 67 authorised undertakers, and in eight further cases to railway and tramway authorities and non-statutory undertakings, representing in the aggregate a plant capacity of 539,504 kW, practically the same figure as for the preceding year, divided as follows:—Local authority undertakers, 331,800 kW; company undertakers, 177,950 kW; railway and tramway authorities, 19,500 kW; and non-statutory undertakings, 240 kW; the remaining 10,000 kW was accounted for by a consent to the West Midlands Joint Electricity Authority. The principal consents were issued to the installation of 125,000 kW at Deptford by the London Electric Supply Corporation, Limited; 62,500 kW in the Portobello station of Edinburgh Corporation; a 40,000-kW set in the Barton station of Manchester Corporation; 27,500 kW in the Valley Road station of Bradford Corporation; a 25,000-kW set in the Lister Drive station of Liverpool Corporation; and 20,000 kW in the station of Stepney Borough Council.

Applications were refused in two cases: Nuneaton Corporation and Mexborough Urban District Council, as bulk supplies were available.

Main Transmission Lines.

Consents were issued in respect of 67 applications, as compared with 42 in the preceding year; 23 of them related to 33,000-volt lines.

(To be continued.)

Legal.

Failure to Stamp Insurance Cards.

AT Otley Police Court, recently, Frank Gill, electrician, Nelson, was charged with failing to pay National Health and Unemployment Insurance contributions in respect of a man in his employ and with failing to return a card. Mr. T. J. Reilly, Ministry of Health inspector, said the case was originally heard last June and adjourned to give defendant time to pay up arrears, and this he had now done. But he had committed a breach of trust, which the Department regarded seriously, and they asked for a conviction. Mr. J. C. DACRE (defending) expressed defendant's regret, and said Gill began business foolishly without capital, stamped the man's card until it was lost, had to make a deed of assignment, and yet had managed to pay what was due in this case. A fine of £5 was imposed.

Greenock Corporation v. The Admiralty.

IN the Court of Session, Edinburgh, recently, the First Division disposed of a reclaiming note for the defenders in the action by the Corporation of Greenock against the Admiralty. The Corporation sought to recover outlay for plant installed at the electricity works to meet the demands caused by war conditions in the locality. The sum involved amounted to £250,670. The chief points at issue in the action were the question of the date to be taken as the termination of the war, and the application of the Indemnity Act of 1920. The date relied upon by the Admiralty was December 14th, 1918. The Corporation submitted that in accordance with an Order of Council the war was terminated on August 31st, 1921, and that it was therefore entitled to charge the difference in cost between the prices ruling on that date and two years thereafter. For the Admiralty it was contended that the action was excluded by the Indemnity Act of 1920, and they further denied being liable to the Corporation for any sum. In the Outer House a proof was allowed, and against this decision the Admiralty appealed.

On December 17th the judges of the First Division held that the Indemnity Act of 1920 did not apply in the present action. It is understood that the dispute may go to the House of Lords.

Pole v. Weinbaum.

IN the Bow County Court, on December 21st, before Mr. Registrar Hore, H. B. Pole, Bow, sued W. Weinbaum, Bow Road, E., wireless accessory dealer, to recover 15s. 6d., alleged to have been paid for "Ever-Ready" batteries, which he alleged were worthless. A Mr. Harris gave evidence, and said he bought two batteries from the defendant, but when he got them home he found that one was useless. He complained to the defendant, who told him to take them back, when he would return them to the Ever-Ready Co. The defendant apparently took no further action, although the witness called a number of times afterwards.

The defendant denied having sold Mr. Harris, or the plaintiff, any batteries whatever, and in proof of that he said these batteries were 9s. 6d. each, so that obviously Mr. Harris had the price wrong. What happened was that Mr. Harris, acting for Mr. Pole, obtained some batteries from a shopkeeper at Forest Gate, but he had never brought any batteries back to him. Mr. Harris insisted that he obtained the batteries from the defendant, and said that his wife was with him. At present she was unable to give evidence.

The Registrar said that he could not accept Mr. Harris's story as he gave it, and he adjourned the case until his wife was well enough to give evidence.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Prorogation.

Parliament was prorogued on December 22nd, until February 7th. The Royal Assent was given to a number of Acts, including the Landlord and Tenant (No. 2) Act, and the Unemployment Insurance Act.

Transmission Lines.

On December 20th Sir DOUGLAS NEWTON asked the Minister of Transport what steps were being taken to review the regulations relating to the construction of electrical transmission lines to meet the special needs of rural areas.

Colonel ASHLEY replied that the regulations were made by the Electricity Commissioners, who had recently held two conferences with electrical engineers having special experience in the construction of overhead lines in rural areas, and were now engaged in considering the proposals and suggestions that were made at those conferences.

Sir MERVYN MANNINGHAM-BULLER asked the Postmaster-General whether he was considering the revision of the regulations issued by his department regarding the erection of overhead transmission lines for electrical power, so as to facilitate and reduce the cost of those lines.

Sir WM. MITCHELL-THOMSON said that the matter was under consideration, but difficult questions were involved as regarded the safety of the public and of the Post Office staff and plant.

The "Doomed" Departments.

On December 21st, the PRIME MINISTER, in reply to Mr. Morrison, read a statement the effect of which was that the Department of Overseas Trade, the Ministry of Mines, and the Ministry of Transport, would not be abolished for the present.

A New Generating Station.

Sir LEONARD BRASSEY asked the Minister of Transport whether his attention had been called to the construction of a new generating station at Little Barford, as proposed by the Electricity Commissioners; whether he was aware that it would not be in proximity to any load and that the needs of the area could be better met by the inter-connection of the Peterborough, Luton, and Bedford stations; and whether he would state the present position of the scheme.

Colonel ASHLEY said that the Electricity Commissioners, as the result of a local inquiry, had made an Order authorising the compulsory acquisition of land for the purpose of constructing a generating station at Little Barford. That Order had now been submitted to him for confirmation, and before confirming it it would be his duty to consider any objections that might be made.

Special Orders.

Special Orders have been approved in respect of part of the rural district of Newbury, Berks., and part of the rural district of Kingsclere, Southampton; the rural district of Whitehaven, Cumberland; the rural district of Knaresborough, West Riding; the rural district of Ampthill, Bedford; the urban district of Billinge-and-Winstanley and Orrell, Lancaster; the city of Ripon and part of the rural district of Ripon, West Riding, and part of the rural district of Wath, North Riding; and the rural districts of Cuckfield and Chailey.

Wireless to the Dominions.

On December 19th Mr. O. NICHOLSON asked the Postmaster-General whether, before any decision was taken by the Government with regard to wireless and cable communications, the same opportunity would be given to the wireless companies here, and in the Dominions and India, of stating their point of view as would be given to the cable companies; and whether the House could have an assurance that in any decisions which the Government might take nothing would be done to hamper the development of wireless in the British Empire.

Sir W. MITCHELL-THOMSON said that the Government had invited the Dominion Governments concerned and the Government of India to nominate representatives to a conference on the question of cable and wireless communications. In the event of their agreeing to do so, the conference would take place as soon as practicable.

The South-East England Electricity Scheme.

On December 19th Sir CLEMENT KINLOCH-COOKE asked the Minister of Transport whether his attention had been drawn to certain criticisms of the South-East England electricity scheme and whether he could state the present position of the scheme.

Colonel ASHLEY said that the scheme and the Book of Supplementary Particulars recently published had been prepared by the Electricity Commissioners and had been transmitted to the Central Electricity Board. The Board, as was its duty, had published the scheme as received from the Commissioners. It was now engaged in investigating the scheme and discussing in detail with the parties concerned the representations which had been made. The whole subject was, therefore, under the consideration of the Board and *sub judice*.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

The Choice of Voltage for A.C. Motors.

In your issue of the 2nd inst., Mr. A. V. Clayton endeavours to criticise British design and construction of high-pressure a.c. motors. The type of winding which he advocates was commonly used in this country 10 or 20 years ago, but it is not now considered good practice. The threading of a conductor 36 times through several closed tubes, and the separation of three vertical tiers of conductors inside a tube by an interleaved 1-mm. thick empire cloth separator, are by no means simple and inexpensive operations. In addition to this there is the drying-out for several days, the impregnation of the complete winding, the dipping and baking of the end windings after each taping, together with repeated dippings and bakings after the final taping. If we are to produce a reliable and cheap motor, I do not think that manufacture on these lines is to be recommended.

Motors for 3,000 volts and above should have the conductors so arranged in the slot as to keep the volts between adjacent conductors at a minimum. For this reason it is preferable to have all the wires in one vertical tier. This may not always be practicable on small motors, but if there are two vertical tiers these should be separated by a good vertical separator between the tiers that can be fitted without fear of damage. Such construction is possible with an open-slot winding or with a winding of the hair-pin type, where the coil is first made in the form of a hair-pin and then pushed through the slots. Windings of these types can also have the slot portions of the coils so treated and pressed to shape as to practically eliminate the air spaces between the conductors themselves and between the conductors and the slot tube. With the threaded-through type of winding advocated by Mr. Clayton, there is danger of a breakdown between the first and last conductors in the slot, as they are only separated by a short air space.

Mr. Clayton is entirely in error in stating that open-slot motors are unable to compete commercially in European markets. The open-slot winding has several very decided advantages, such as low leakage reactance and short length of end coil. With the proper equipment, the coils can be made and insulated very cheaply. The factor of safety of the open-slot winding is much higher than with the threaded-through winding advocated by Mr. Clayton.

Mr. Clayton also condemns vacuum impregnation of windings. With a properly constructed vacuum drying and pressure impregnating plant it is possible to ensure that most of the moisture and air will be extracted from the winding, and with the requisite pressure the impregnating compound can be made to penetrate to the centre of the coils. With windings of the open-slot and hair-pin types it is possible to impregnate the coils before they are placed in the slots, and experience with machines operating in extremely moist conditions and of larger motors with voltages of 11,000 and 22,000 V has shown the great advantage of impregnation.

I agree with Mr. Clayton that it is very important in the design of high-pressure motors to give ample space for insulation and clearance, and, for this reason, there is a limit to the minimum size of motor which one would consider an economical and reliable proposition.

H. Jack.

THE BRITISH THOMSON-HOUSTON COMPANY, LTD.
Rugby, *December 20th*, 1927.

The Perfect Clock.

In your issue of the 2nd inst., Mr. Turnbull correctly states many of the conditions that must be fulfilled, but he does not appear to be aware that all of them—and some others which he does not mention—have been met in the Synchronome Free Pendulum.

Our profession at last is beginning to realise the service which electricity renders to commercial time-keeping by means of circuits of electrical impulse dials, and it cannot be too widely known that it has also contributed to pure horology the science of accurate time measurement—the first real advance for over 200 years, and has again recovered for England the pride of place which she held in the days of Harrison, Graham, and Arnold.

He will find Kelvin's suggestion developed in my Society of Arts paper of May, 1924, and also the reasons for my preference for robust mechanical switching to selenium cells for time counting, and for gravity rather than magnetism for impelling.

The Synchronome Free Pendulum (as designed by Mr. W. H. Shortt, M.Inst.C.E.) was immediately adopted as the sidereal standard clock at Greenwich, on its installation in January, 1925. Twelve months later another was installed, and the variations of their relative rates have not exceeded one hundredth of a second per day. It has revolutionised the method of time determination.

Previously the differences between transit observations and the clock were debited to the clock. It is now recognised that no individual stellar observation can say that this Free Pendulum is wrong. The average of a long series of transits is required to make a small alteration in the direction of the forecasted rate-line of the clock. Such a deflection seldom exceeds 0.01 of a second per day, and some months' observations are often required to establish even that degree of error.

Formerly nutation was neglected by the astronomers in the process of clock comparisons and of time determination, as such a small matter would be altogether submerged in the errors of the best clock. Now, however, the Free Pendulum reveals it.

These achievements testify to the truth of the principles stated by Mr. Turnbull, and it is satisfactory to know that the conditions have been fulfilled by a substantial remontoire switch capable of operating whatever circuits of electrical impulse dials may be required.

F. Hope-Jones.

London, *December 19th*, 1927.

The correspondence has been useful and interesting, and, I hope, has advanced the subject. The effect of moving a ton of coals on a clock was reported in a scientific journal, but I think it possible that the variation had produced some movement in the floor and that that affected the clock. Clocks of the grandfather type are sensitive to movement at the base, and it is often possible to improve their time-keeping appreciably by fixing the top of the case to a brick wall.

I was glad that Dr. Robertson reported that the idea had been anticipated: improvements have usually to be reinvented many times before they come into use; for instance, the steam turbine was invented scores of times before it materialised in a practical form. The essence of the idea which I set forth was a clock in which the pendulum would be kept swinging by magnetic impulses applied to a piece of magnetic material fixed at the centre of oscillation, with the operation of all indicating apparatus, &c., by the action of beams of light on suitable cells. Some time ago I heard an I.E.E. address by one of the designers of one of our great instrument firms, and the impression I obtained was that the fulfilment of the requirements of the electric clock would give no trouble if entrusted to him, or to men of his calibre, who are available in this country if people are willing to make use of their services. For this reason I did not set out the mechanical details which I had in mind, but the following may serve as a sketch. The constant-voltage battery need give little trouble: a suitable accumulator (which could be kept charged up by a small constant current from the mains) would do the needful. The light beams would probably be reflected from mirrors, on the galvanometer method. The solenoid current could be kept constant by using a resistance which would be controlled by a fine adjustment which, in its turn, would be controlled by a beam of light reflected from a mirror attached to the pendulum. I have worked out the mechanical details and will be glad to pass them on to anyone interested. The impulses would be given to the pendulum at that part of the swing most favourable to timekeeping.

Before making such a clock, it would be worth while having the whole theory thrashed out by a mathematician who preferably knew a great deal about mathematics and not enough about clocks to have any prejudices towards any existing opinions.

C. Turnbull.

Electricity Works, North Shields.
December 19th, 1927.

Pulverisers or Stokers?

Regarding Mr. Pausey's article on the above, although I have still some doubts as to the greatly advertised extra efficiency to be obtained from pulverised fuel (with all respect to the fact that undoubtedly it is the best means of burning fuel), the stoker side has been discussed in a manner which shows operative inexperience.

I certainly agree that bigger combustion chambers will improve conditions, but Mr. Pausey makes airy statements that:—

1. There is no difficulty in maintaining 13 to 14 per cent. of CO_2 with coal containing 8,500 B.th.u. and with 25 per cent. ash.—He has said nothing about the output at the same time, which is rather essential.

2. The construction of a hollow wall in the front of the boiler should present no difficulties.—A month or two with one of the leading boiler makers will convince him of the difficulties of construction and of the prevention of bulging due to the high temperature. A modified form of this arrangement was tried as far back as 1912 and discarded promptly.

3. There should be no difficulties in use.—I should like to know how he would keep the wall air-tight and prevent air leakage at the higher parts into the combustion chamber. The regulation of the supply of hot air for varying loads would require serious attention, and the admission of air as shown in his figure 3 would lead to a baffling of the air passing through the coal under the arch, with the result that the temperature of the arch would be seriously decreased and its function destroyed, so that the portion of the grate under the arch would be non-effective. The utilisation of fuel of 8,500 B.th.u. under these conditions would give the boiler-house engineer

food for ——— thought! It would be more suitable to introduce the hot air at the front or hopper end of the grate and under the arch.

To my mind the case for pulverised fuel has—in view of the capital cost, maintenance, and skilled attention necessary—yet to be proved; by providing the stoker furnace with the additional gadgets necessary to a pulverised furnace, there is very little between the two in efficiency.

Malcolm G. Wallace.

Enfield, *December 19th*, 1927.

The Cost of Service Connections.

If a little publicity be given to an incident which we have recently experienced, it may emphasise just a little more to the less enterprising supply companies the absolute necessity of waking up, and of dealing with their business more carefully.

We recently wrote to a certain supply company asking if there would be any charge to make electric light available at two addresses which we gave them, and, if so, requesting that we might be furnished with the details thereof. Whilst waiting for the reply we had to send one of our engineers to both of the addresses mentioned, and found that in the one case the main ran right outside the premises, whilst in the other case the whole place was already electrified (the inquiry we had from our customers was in connection with the installation of a modern lighting scheme).

To our astonishment, a few days later we received a letter from the supply company concerned, stating that in the first case the cost of connection would be £3, and in the second case, which we had already found to be electrified, it would be £4 10s.!

About a week ago we wrote them pointing out their mistake, and asking for details of how these estimates were prepared. This particular example, we suggest, gives one cause to think that these premises were not visited at all, but that somebody made a hearty guess, then added a bit on to make the figures safe, and then had the optimism to wait and see if we would swallow the whole business.

Unfortunately, this is by no means an isolated case with this particular supply company—we only wish it were.

Mortimer & Gall.

J. MORTIMER.

London, *December 2nd*, 1927.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1926.

210. "Thermionic valves for wireless receiving apparatus." A. H. Midgley. September 1st, 1926. (280,981.)

13,556. "Repeaters for electric signalling circuits." O. Y. Imray (Gamewell Co.). May 28th, 1926. (281,173.)

16,738. "Method of and means for controlling the transfer of electrical energy." L. G. King. July 3rd, 1926. (281,353.)

18,126. "Refrigerating systems." W. H. Carrier and Carrier Engineering Corporation. July 20th, 1926. (281,356.)

19,065. "Thermionic tube." Dr. S. Loewe. August 1st, 1925. (256,285.)

19,067. "Multiple-grid thermionic tube." Dr. S. Loewe. August 1st, 1925. (256,267.)

21,009. "Automatic switching arrangements for reversing the direction of traffic over a telegraph line or cable." E. C. R. Marks (Western Union Telegraph Co.). August 26th, 1926. (281,363.)

21,215. "Electrical plug-and-socket couplings or connectors and switches." G. H. Scholes, F. J. Pearce and G. H. Scholes & Co., Ltd. August 28th, 1926. (Cognate application 32,824/26.) (281,366.)

21,225. "Coupling-apparatus for use in wireless signalling." A. J. Stevens and Co. (1914), Ltd., and H. C. Willson. August 28th, 1926. (281,367.)

21,338. "Circuit arrangements in automatic telephone systems." Siemens Bros. & Co., Ltd., and W. G. Patterson. August 30th, 1926. (Addition to 271,142.) (281,371.)

21,444. "High-frequency electric induction furnaces." N. R. Davis and Metropolitan Vickers Electrical Co., Ltd. August 31st, 1926. (281,379.)

21,459. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). August 31st, 1926. (281,381.)

21,564. "Electric switches and contacts." T. G. Nyborg and H. C. Jenkins. September 1st, 1926. (281,387.)

21,585. "Devices for changing the frequency of electric currents." A. B. Howe. September 1st, 1926. (281,391.)

21,769. "Electric cables and conductors." British Insulated Cables, Ltd., G. H. Nisbett and F. J. Brislee. September 3rd, 1926. (281,397.)

21,738. "Multiple-unit electric control." British Thomson-Houston Co., Ltd., and C. J. Sargeant. September 3rd, 1926. (281,398.)

21,745. "Vacuum electric tube devices." E. Y. Robinson, E. J. E. Hubbard and Metropolitan-Vickers Electrical Co., Ltd. September 3rd, 1926. (281,400.)

21,747. "Filaments of vacuum electric tube devices." E. Y. Robinson and Metropolitan-Vickers Electrical Co., Ltd. September 3rd, 1926. (281,401.)

21,844. "Circuit arrangements for hunting switches in telephone systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. September 4th, 1926. (281,407.)

22,796. "Variable electrical resistances." A. W. Stapleton. September 15th, 1926. (281,415.)

23,106. "Electric distribution apparatus for use with concentric and like cables." H. J. Fuller. September 20th, 1926. (281,421.)

23,152. "Thermionic tubes particularly adapted for the generation of oscillations." British Thomson-Houston Co., Ltd. October 17th, 1925. (259,937.)

23,829. "Process and apparatus for the electrolytic preparation of magnesium and metals of the alkaline earth." A. C. Jessup. October 9th, 1925. (259,554.)

24,018. "Diaphragm apparatus or devices for reproducing sound." W. Bullen. September 29th, 1926. (281,427.)

24,711. "Electric installation fittings." G. R. Brown. October 5th, 1926. (281,429.)

25,875. "Electric switches." W. T. Henley's Telegraph Works Co., Ltd., W. H. Nichols and E. Moor. October 16th, 1926. (281,439.)

26,905. "Lamps or searchlights for aircraft." A. Rohrbach. October 30th, 1925. (260,576.)

26,263. "Lights and illuminated signals for the rear of motor vehicles and the like." Powell & Hanmer, Ltd., and W. J. Daniel. October 21st, 1926. (281,441.)

26,552. "Incandescent cathode discharge tubes for rectifying alternating currents." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). October 23rd, 1926. (281,446.)

27,134. "Oil-cooled electric transformers." A. W. G. Tucker, and Ferranti, Ltd. October 29th, 1926. (281,451.)

28,030. "Sound-reproducing apparatus." L. Stevens. July 21st, 1926. (274,801.)

32,033. "Loud speakers." F. Saldana. December 17th, 1925. (263,189.)

1927.

2,177. "Electrically-operated order telegraphs and the like." Evershed and Vignoles, Ltd., and R. Ainsley. January 25th, 1927. (281,504.)

4,412. "Incandescent cathode rectifiers." F. Meyer, H. J. Spanner and C. Von. Wedel. July 16th, 1926. (274,026.)

4,587. "Charging apparatus for electrically-heated annealing and other furnace installations." Akt. Ges. Brown, Boveri et Cie. February 20th, 1926. (266,368.)

5,839. "Electrical relays." F. Whipp and Whipp & Bourne, Ltd. March 2nd, 1927. (281,514.)

6,968. "Electromagnetic relays, switches, and the like." British Thomson-Houston Co., Ltd. March 25th, 1926. (268,324.)

7,924. "Control of vehicle head-lights." A. Kellner. March 22nd, 1927. (281,521.)

8,831. "Electric motors." R. Bosch Akt. Ges. April 15th, 1926. (261,517.)

10,046. "Induction coils for wireless apparatus." A. S. Pianchon. April 14th, 1926. (269,550.)

10,074. "Picture and the like telegraphy." Marconi's Wireless Telegraph Co., Ltd. April 13th, 1926. (269,559.)

10,156. "Cores for electric transformers and the like." International General Electric Co., Inc. April 21st, 1926. (269,894.)

10,438. "Combined ignition and lighting devices for use with internal-combustion engines." Villiers Engineering Co., Ltd., and F. Pountney. April 19th, 1927. (281,529.)

11,171. "Lead-sheath single- and multi-cored cables." H. Glaser. April 26th, 1927. (281,535.)

12,300. "Mercury switches." Soc. Anon. Hewittic and M. Demontvignier. June 21st, 1926. (272,866.)

13,530. "Method of rapidly de-exciting dynamo-electric machines." A. L. Mond (Maschinenfabrik Oerlikon). May 19th, 1927. (Convention date not granted.) (272,189.)

13,612. "Thermostatic switches." Metropolitan-Vickers Electrical Co., Ltd. May 20th, 1926. (271,505.)

13,783. "Therapeutic light-radiating appliances." P. Dziuba. May 23rd, 1927. (281,542.)

15,646. "Sparking plug for internal-combustion engines." F. Wolf. June 7th, 1927. (281,548.)

15,102. "Shackles for attaching high-tension cables to their supports." F. Berg. June 7th, 1927. (281,549.)

15,107. "Insulator for electric cables carrying high voltages." F. Berg. June 7th, 1927. (281,550.)

15,395. "Flicker-producing devices for electric fires and other electrically-illuminated appliances." H. H. Berry. June 9th, 1927. (281,552.)

15,664. "Process for the production of electronic discharge tubes and tubes produced by such process." E. Rouge. June 14th, 1926. (272,549.)

16,053. "Basing machines for electric incandescent lamps and similar articles." British Thomson-Houston Co., Ltd. June 16th, 1926. (272,934.)

16,848. "Apparatus for interchanging power between electrical circuits." British Thomson Houston Co., Ltd. June 29th, 1926. (273,697.)

17,062. "Means for exciting cascaded commutator machines with the supply circuit frequency." Siemens-Schuckertwerke Ges. June 28th, 1926. (273,330.)

17,086. "Magnetic core for electrical machines." Constructions Electriques de Belgique Soc. Anon. June 26th, 1926. (273,335.)

18,197. "Cascade-connected commutator machines for asynchronous induction machines." Siemens-Schuckertwerke Ges. July 21st, 1926. (Addition to 240,831.) (274,844.)

18,686. "Explosion-proof fitting for electric glow-lamps." J. Beckmann. July 14th, 1927. (Addition to 280,030.) (281,569.)

18,977. "Electric heating unit." R. Ferck. July 18th, 1927. (281,571.)

19,028. "Starting devices for internal-combustion engines." Motorenfabrik Deutz Akt. Ges. July 23rd, 1926. (274,861.)

19,609. "Methods of starting and lighting power vehicles." Soc. de Paris et du Rhone. September 8th, 1926. (Addition to 262,054.) (277,300.)

21,574. "Air-insulated transformers for high tensions." E. Huefely and Cie. Akt.-Ges. August 21st, 1926. (276,334.)

21,970. "Igniting in internal combustion engines." L. Renault. October 13th, 1926. (279,035.)

22,256. "Telephone systems." Standard Telephones and Cables, Ltd., and L. B. Haigh. August 28th, 1926. (Divided application on 281,021.) (281,584.)

23,676. "Process and device for the acoustic reproduction of low-frequency sound currents from a radio receiver." Dr. G. Eichhorn. September 11th, 1926. (277,355.)

23,801. "Cam-actuated contact lever system, particularly for electric tram controllers." Maschinenfabrik Oerlikon. April 11th, 1927. (281,586.)

28,740. "Arc-welding electrodes and holders therefor." International General Electric Co., Inc. October 30th, 1926. (279,886.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 21st:—

Homestead (lettering and design). No. 481,233. All goods in class 8.—Baxendale & Co., Ltd., Manchester.

Bremola. No. 484,749. All goods in Class 8, but not including electric batteries or goods of a like nature.—Waddington & Sons, Ltd., Scarborough.

Sifam. No. 485,766. All goods in Class 8.—Sifam Electrical Instrument Co., Ltd., 10a, Page Street, S.W.1.

Touchbestos. No. 485,837. Class 8. Electric cables.—Saxonia Electric Wire Co., Ltd.

Society of Technical Engineers.

In addition to its usual handbook the Society of Technical Engineers has decided to issue a Management Bulletin, the first number of which, December, 1927, is now available. This decision is based on the fact that the Society has to serve the economic interests both of technical engineers and of the engineering industry. In the Bulletin, therefore, the management movement and affairs appertaining to engineers and engineering will be dealt with, while the circular will be reserved for the domestic concerns of the Society and matters having to do with the status and position of technical engineers.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ADWICK-LE-STREET (YORKS.).—80 Council houses, at Park Lane and Chestnut Avenue, Skellow; surveyor, Village Street.

ALFRETON.—Housing scheme (92), for the U.D.C.; surveyor.

AXBRIDGE.—Nursery and laundry (£5,000), for the B.G.; Ball & Pope, architects, Weston-super-Mare.

BEXHILL.—Houses, Chepbourne Road; J. H. Lye, Chepbourne Road.

BIRMINGHAM.—Cinema, Nestley Road, for E. J. Smith; H. G. Bradley, 10a, Temple Road, architect.

BOURNEMOUTH.—Additions, Royal Bath Hotel, Bath Road; Hotel Co. Houses, shops, garages, &c., for Hankinson and Son, The Square and Richmond Hill. Additions, South-Western Hotel, Northcote Road; Eldridge, Pope and Co., Ltd.

BRADFORD.—Electric lighting, Butchers' Section, Rawson Place Market; Markets Committee.

BRIGHTON.—Rewiring Training College hostels; Education Committee.

BROADSTAIRS.—Concert hall to seat 800, and shelter, for the U.D.C.; surveyor.

BURSLEM.—Laboratory, Reginald Road; British Aluminium Co. Electric furnace, Doulton Potteries; Doulton & Co., Ltd.

BUXTON.—College extension for Derbyshire E.C.; G. H. Widdows, architect, St. Mary's Gate, Derby.

CRADLEY HEATH.—United Methodist Church, Colley Gate; trustees.

CREWE.—Garden City scheme; Fletcher & Son, builders, Hightown.

CROYDON.—22 houses, Springfield Road; R. Pierson.

DARTFORD.—Wiring 48 Council houses; U.D.C. surveyor.

DOUGLAS (I.O.M.).—Alterations, South Quay; Anglo-American Oil Co., Ltd. Electricity supply, Mental Hospital; medical superintendent.

DOVER.—Reconstruction of isolation hospital (£8,630), for the T.C.; J. F. Duthoit, architect.

EASTBOURNE.—Public library (£9,538), for the T.C.; Miller and Selmes, builders. Houses (48), for the T.C.; W. J. Simmons, Son & Cook, Ltd., builders, Nottingham.

ECKINGTON.—Secondary school, for Derbyshire E.C.; G. H. Widdows, architect, St. Mary's Gate, Derby.

ELFORD (STAFFS.).—Beet sugar factory; secretary, Tamworth Branch, National Farmers' Union.

EPSOM.—Enlargement, Manor Asylum; L.C.C. architect.

HANLEY.—Roman Catholic church (£6,000), Birches Head; priest-in-charge. 40 houses, Etruria Vale; C. Cornes and Son.

HASTINGS.—Extensions, Motor Parking Station, Fishmarket; borough engineer.

HATFIELD (HERTS.).—Additional housing scheme (36), for the R.D.C.; surveyor

HEANOR.—Mining and technical institute, for Derbyshire E.C.; G. H. Widdows, architect, St. Mary's Gate, Derby.

HENLEY-ON-THAMES.—Electric light installation, institution, for the B.G.; clerk.

HORDEN (Co. DURHAM).—Houses (148), for H. Bell, Ltd. Houses (52), for G. Riddell.

KIDDERMINSTER.—Carpet works, Hurcott Road, for W. and R. R. Adam.

LEIGHTON BUZZARD. — Extensions, Cedar Schools (£20,000), for Beds. E.C.; director of education, Bedford.

LONDON (WEST HAM).—Extensions, Goodmayes Asylum: borough engineer.

(BLACKFRIARS, S.E.).—Premises for social work; Salvation Army.

(CATFORD, S.E.).—16 shops and flats, Catford Road; J. Watts. Shops, 130-134, Rushey Green; F. W. Woolworth and Co., Ltd.

(WOOLWICH, S.E.).—186 houses, Eltham Estate; borough engineer.

(BATTERSEA, S.W.).—Alterations and additions, 24-26, St. John's Road; J. Lyons & Co., Ltd.

(FULHAM, S.W.).—Nursing home, Gledstanes Road; H. Paul.

(TOOTING, S.W.) —Alterations and additions, Grove Hospital, Tooting Grove; L. Kazak, Ltd.

(WANDSWORTH, S.W.).—Factory and offices, Merton Road; Walter Lawrence & Son, Ltd.

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NEWPORT (I.O.W.).—Stores and workshops, St. James Square; Strattan & Millgate, architects.

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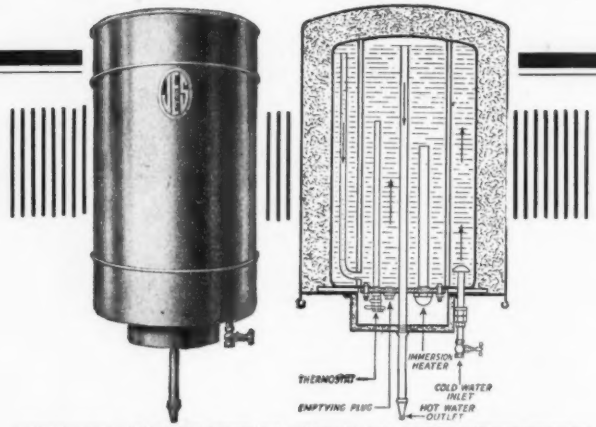

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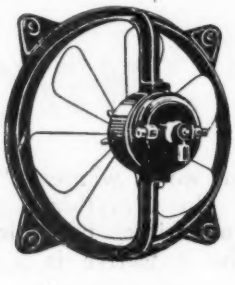

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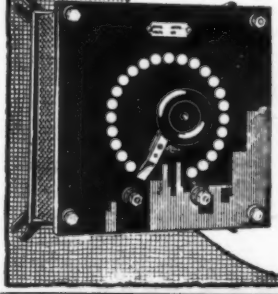

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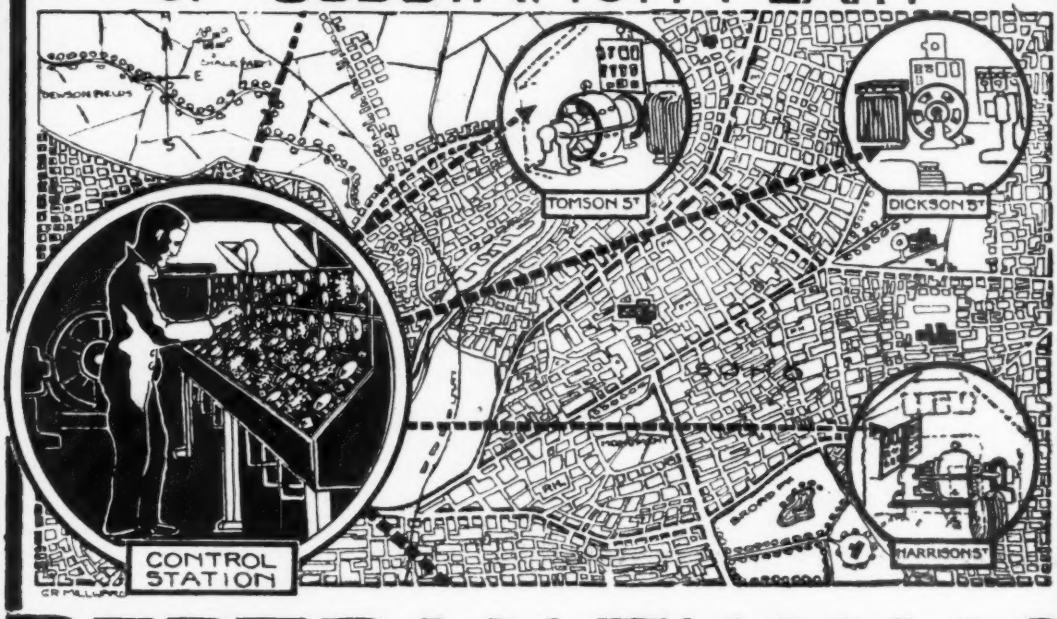

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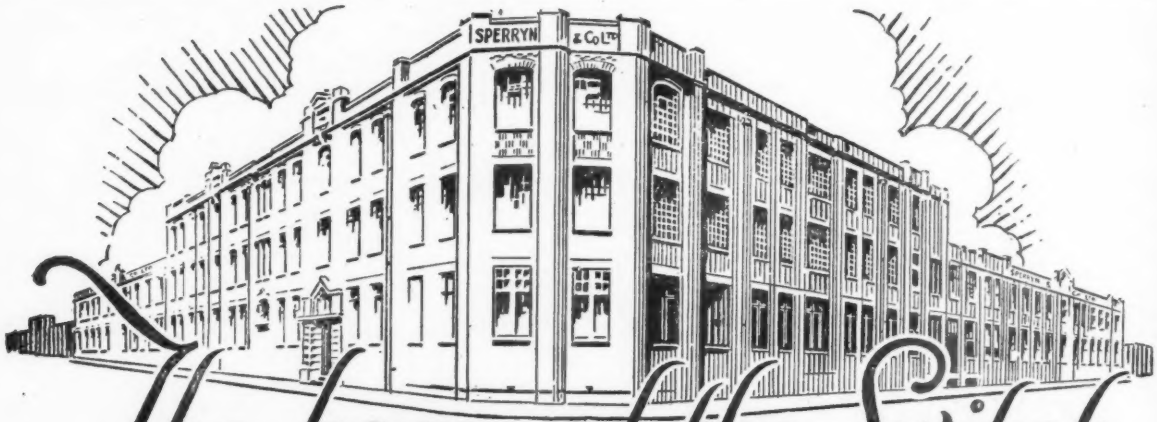

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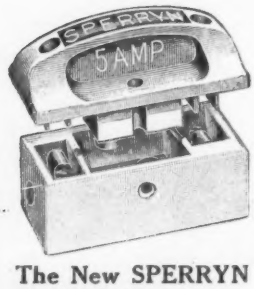

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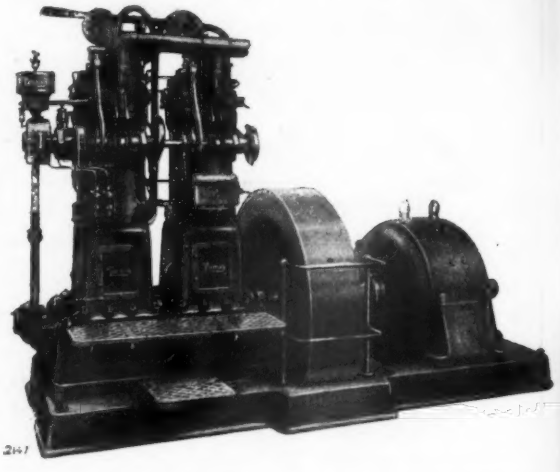

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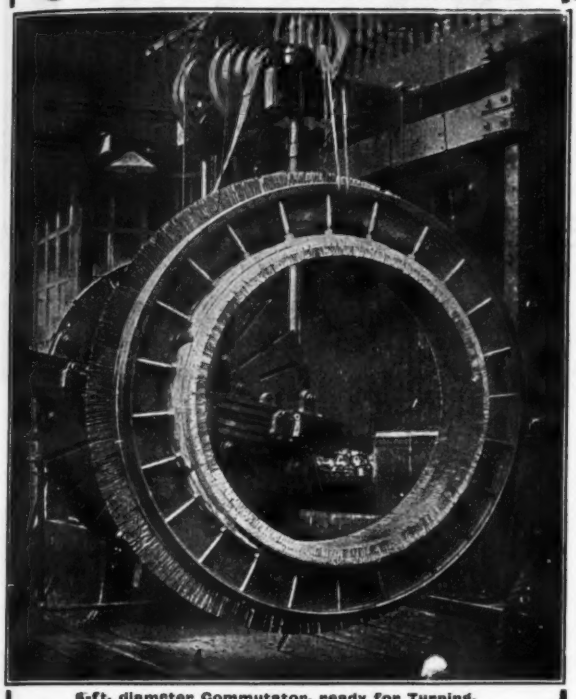

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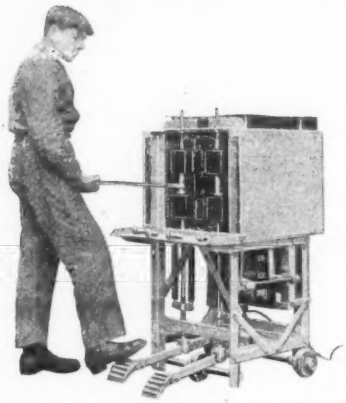

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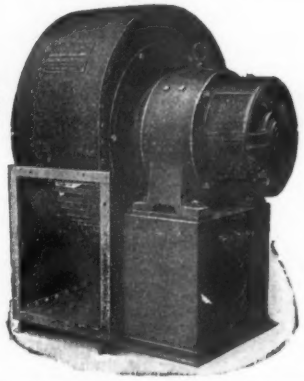

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Made in three sizes to take respectively 5", 6", or 9" emery wheel.

Supplied for direct current or alternating current two or three phase.

DESIGNED TO DO THE MAXIMUM WORK FOR THEIR WEIGHT AND SIZE.

Specially adapted to use in foundries, machine shops, and to general engineering processes.

Special Features : EASE OF MANIPULATION—BALL BEARINGS—AIR COOLED.

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Manufacturing · Electrical · Engineers

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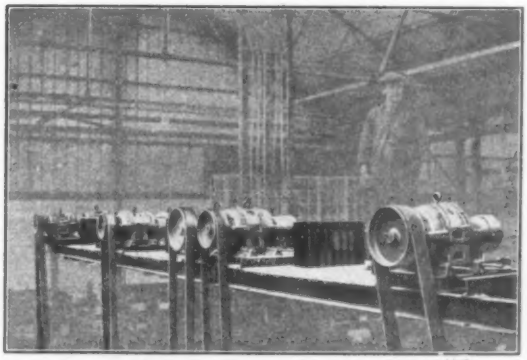

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A group of Holmes' motors installed in a large Engineering Works.

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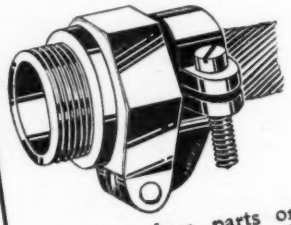
Heavy Brass Watertight Continuity Glands.

For making watertight metallic connection between Armoured Cable and Iron Boxes.



Extreme simplicity.

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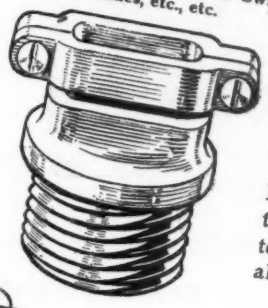
A perfect joint.

Embodies four parts only—nipple for connection to box, gland through which the lead sheathed cable is passed and sweated thereto, nut which slides along the cable and is then screwed home, and hinged clamp placed in position and tightened up.

"Walsall" Bonding Nipples.

For metallically connecting metal sheathed cable to any class of Ironclad Switch and Fusegear, Junction Boxes, etc., etc.



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Made in three patterns and in all sizes.

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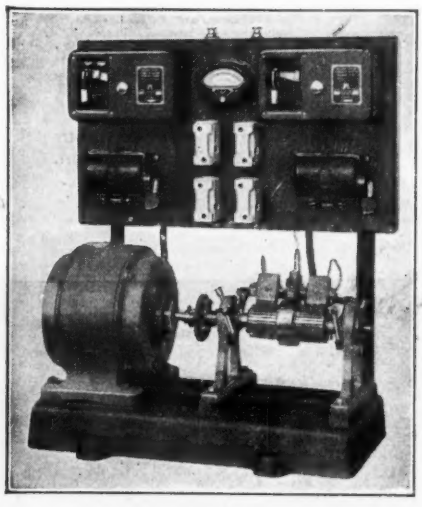
8 Points to PROVE that OUR SYSTEM IS BETTER THAN CONSTANT POTENTIAL.



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The specifying of "GLASGOW-REX" is a kingly gesture. For it indicates a knowledge which is high and superior. This man knows, and his knowledge is supreme. "GLASGOW-REX" then, is the servant of a king and is in itself a king. It is the most popular heavy-duty switch in the electrical industry, and is available in capacities of from 30 to 200 amperes, for pressures up to 500 volts—double and triple pole; with and without fuses.

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"GLASGOW-REX" complies with the requirements of the I.E.E. Regulations (8th edition), and B.E.S.A. Specification 124 and is licensed to be so marked. It is indeed the king amongst switches. Can this be said of the Gear you use?

Leaflet 155 gives full details.

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THE MARK OF EXCELLENCE
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There is a big field for these reflectors in your area. Every shop and store-keeper appreciates good lighting and Sterling Reflectors will satisfy both you and your clients.

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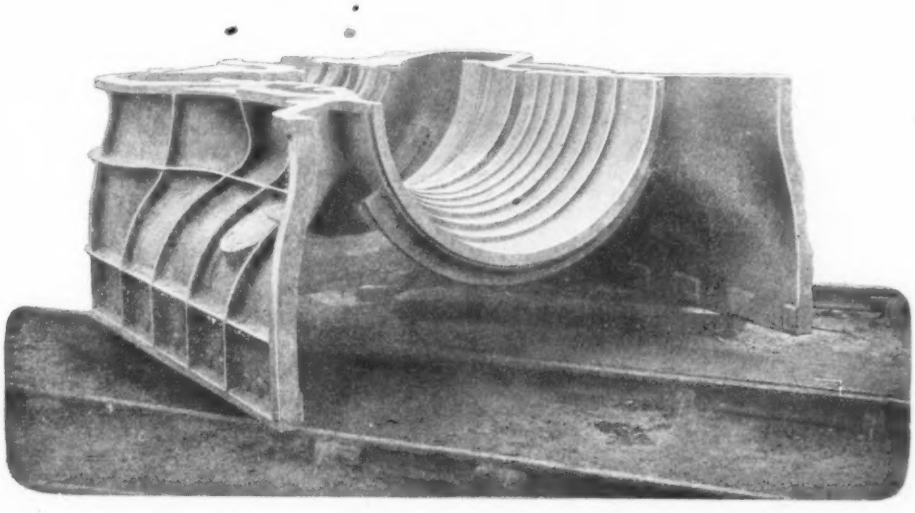

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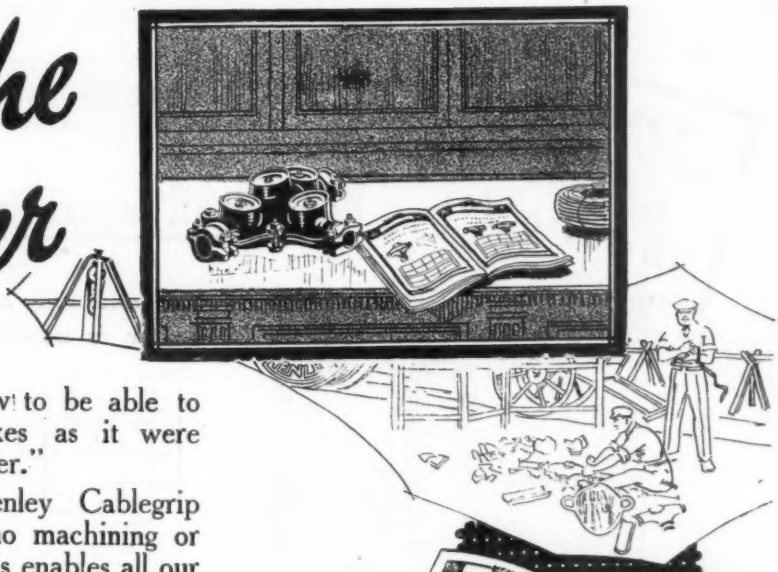

IT is something new to be able to buy Service Boxes as it were "over the Counter."

With the new Henley Cablegrip Service Box there is no machining or drilling necessary. This enables all our Branches to carry stocks for your convenience.

You can issue these Boxes from your Store to the Jointer without the necessity of boring out lead or wood bushes.

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Belfast—26, Fountain Street	"	5798.
Dublin—43, Dame Street	"	511.
Newcastle—Pandon Buildings, Manors	"	City 60.
Liverpool—37/41, Duke Street	"	Royal 790.
Manchester—4, Marble Street, Spring Gardens	"	Central 8297/8.
Leeds—95, Albion Street	"	23171.
Sheffield—24, York Street	"	24509.
Birmingham—Broad Street Chambers	"	Midland 2621/2.
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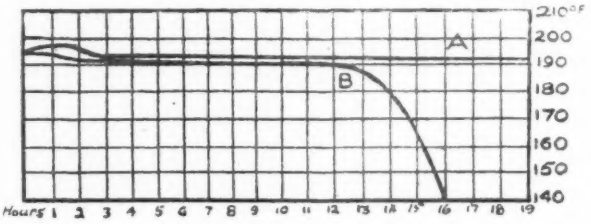

CURVE "A" shows the water heated to 190° F., current switched off, and no water withdrawn during the test. The water temperature rises to 197.2° F., at the end of the first hour, owing to heat stored in the heater passing to the water; 19 hours after switching off the temperature is still 192° F. —a fall in temperature of only 4° F. in 19 hours. This proves the remarkable efficiency of the heat insulation.

CURVE "B" is a curve approximating to working conditions. Current off throughout the test and an initial water temperature of 196° F. One-sixteenth of the full capacity (13⅞ gallons) is withdrawn every hour for 16 hours and an equal quantity of cold water at 52° F. admitted. At the end of the 13th hour the temperature of the water delivered is 187° F., or 9° F., below the initial water temperature; even at the end of the sixteenth hour, after current has been shut off, the temperature of the last drop of water originally heated is 142° F.

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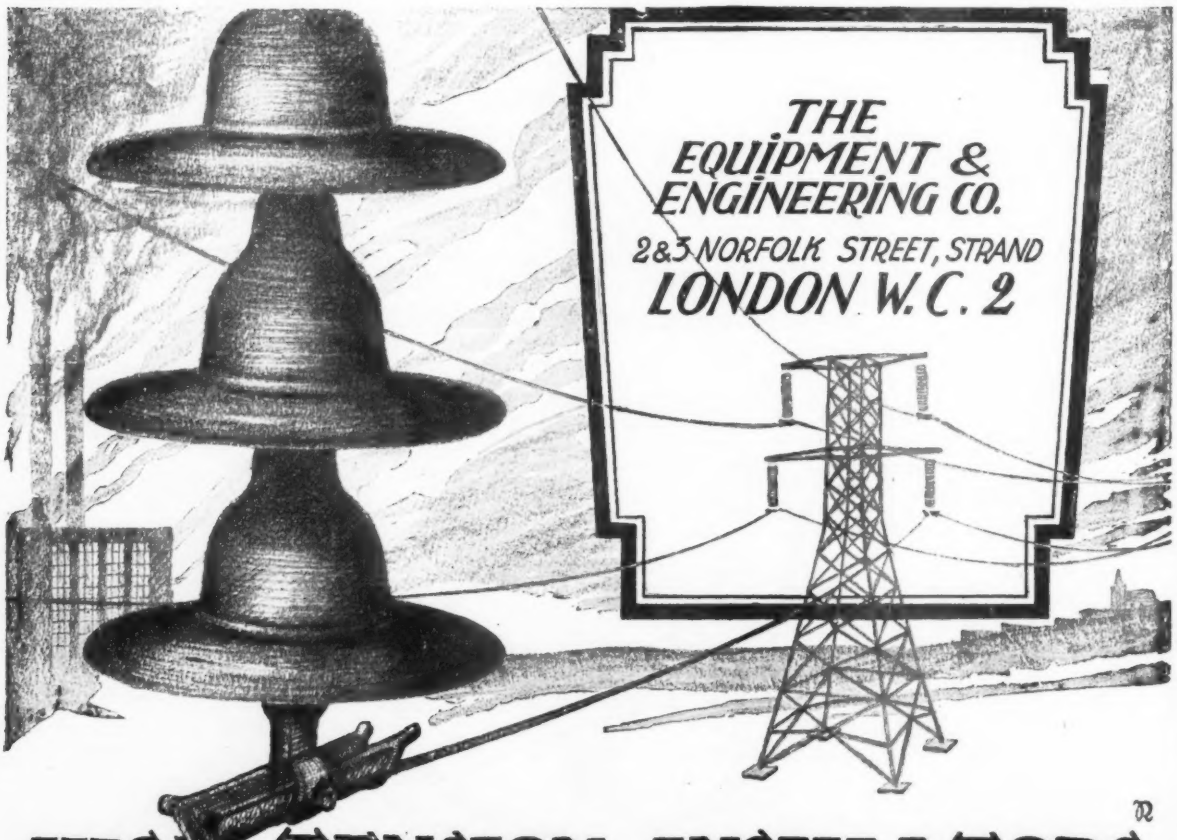

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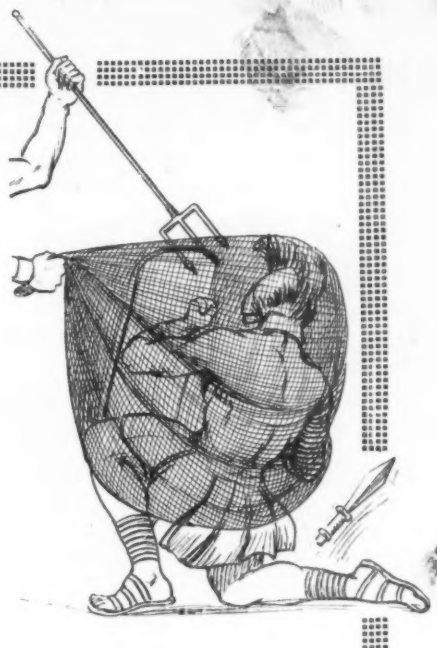

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have been a troublesome problem to man from the early ages—from the time of the *retiarius* of Ancient Rome to the present day Central Station Mains Engineer responsible for the distribution of electrical energy over wide areas.

Our efforts are directed to the elimination of the "mains man's" worries, where joints on the networks are concerned, by producing Joint-Box and Sleeve Compounds of highest quality only: Reliable *absolutely* for the most rigorous service.

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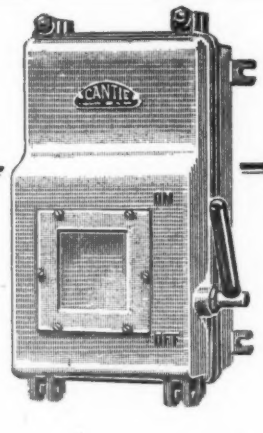

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A Heavy Duty Fuse

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Moulded-Arc Proof-Unbreakable

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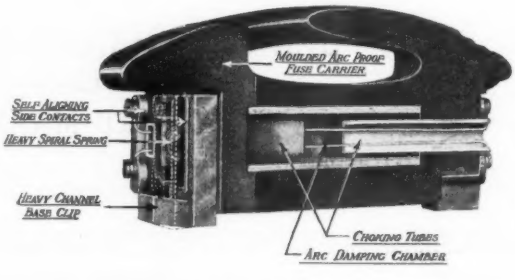

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600-volt, 200/300-amp. Fuse Test.—Wired with tinned copper wire to blow at 528 amperes, and dead short circuited across a 500-volt battery with no limiting resistance in circuit. Fuse cleared without damage.

IF YOU REQUIRE MODERN FUSE GEAR WRITE TO US.

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FUSE & ELECTRICAL MFG. Co LTD

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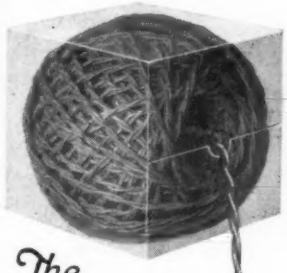

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No kinks or knots to unravel.

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In usual sizes.

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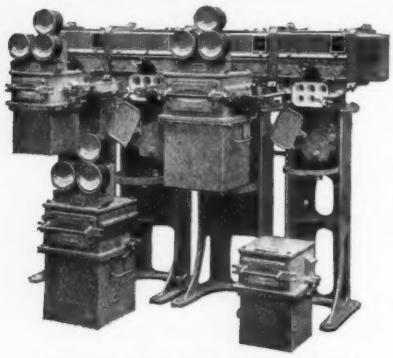
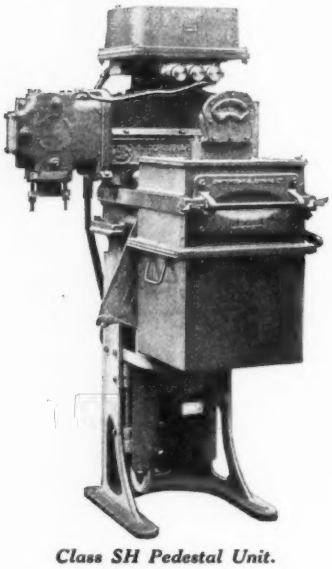
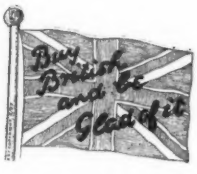


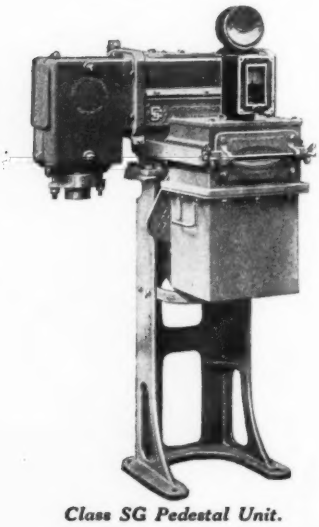
Four-Panel Board of Classes SF and SG Units, Circuit Breakers removed from two Pedestals.



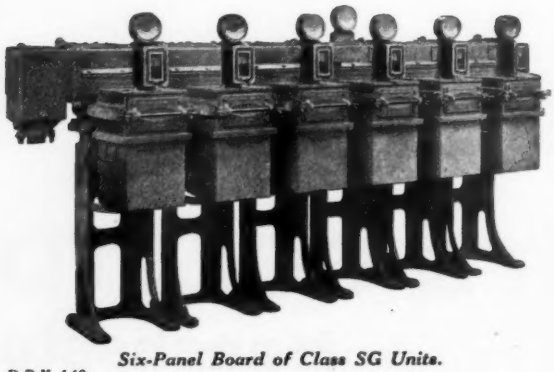
Class SH Pedestal Unit.



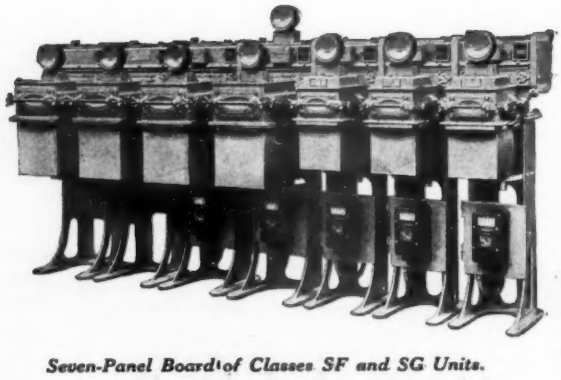
Send for Catalogue Section No. 3 (New Edition).



Class SG Pedestal Unit.



Six-Panel Board of Class SG Units.



Seven-Panel Board of Classes SF and SG Units.

D.R.K 140.

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Controlling Industry's Electric Supply.

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It is made for A.C. and D.C. Central Stations, Sub-stations, Factories and all Industrial Installations, and in Flameproof Form for Collieries.

It is proof against Damp, Dirt and Vermin, and being completely interlocked ensures safe and continuous control with complete protection against accidents and misuse.

Notwithstanding the present-day tendency in switchgear construction to cut prices at a sacrifice of material and workmanship, S & C continue to maintain their policy of building simple, compact, high-class gear of

Modern Design combined with Old-time Robustness.

Yet the prices compare favourably with those of Switchgear with less claims to distinction in construction and efficient service.

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Maintenance Engineers!

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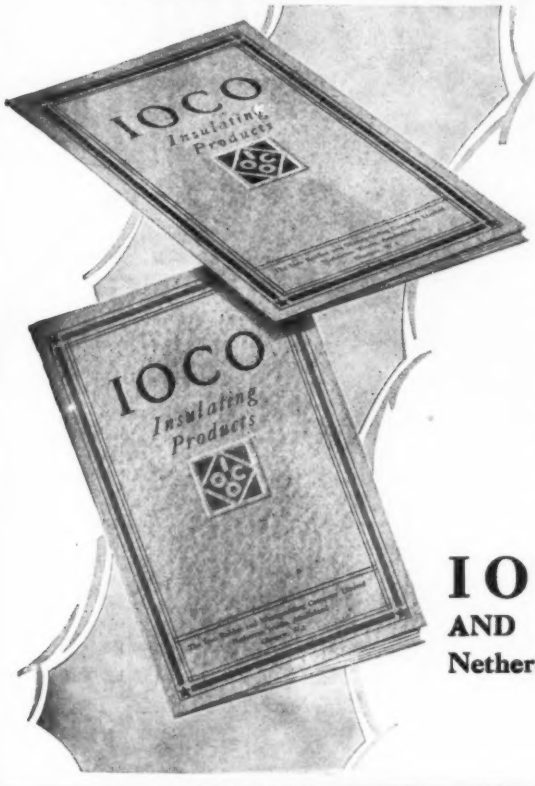

Before commencing that re-winding operation, consider carefully the insulating materials you should use. These booklets issued by the IOCO Company deal with all manner of insulation, and give valuable advice on the most suitable grades of insulating material to use to obtain complete satisfaction. Maintenance engineers would do well to send for copies immediately.

The IOCO Company, backed by the well-equipped laboratories and a staff of research engineers have kept pace with modern high voltage demands and produce insulating materials possessing high electrical and mechanical properties.

IOCO RUBBER
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has many outstanding features, not the least important of which is the method of identifying the cores in a single, twin, or three-core cable system by means of a coloured insert.

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ARE TO BE FOUND
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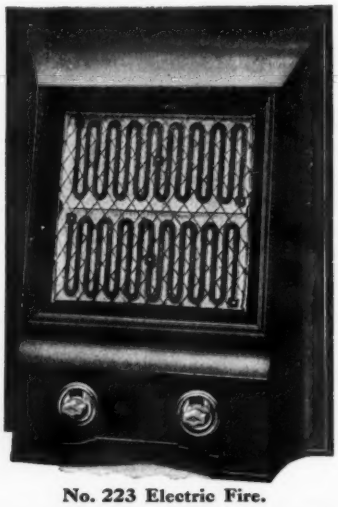

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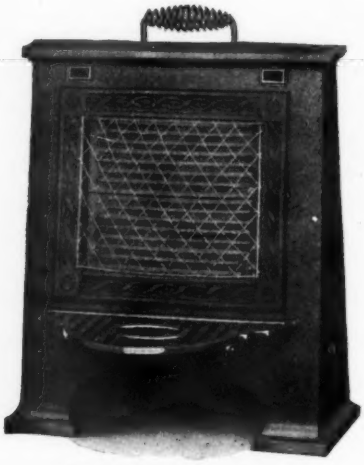

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No. 223a Electric Fire.

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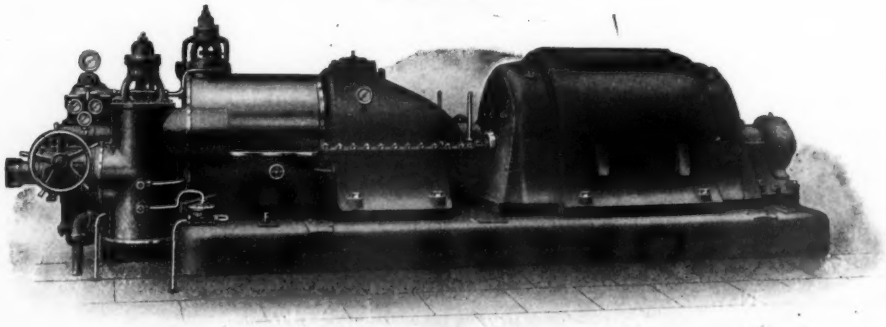

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SIEMENS BROTHERS & CO., LTD.,

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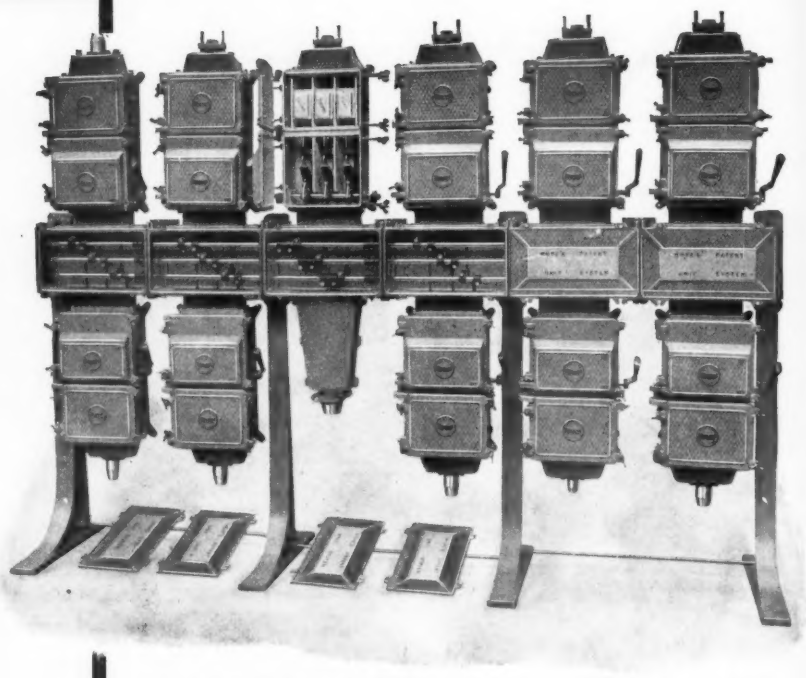
We have devoted special study to the control and fusing of distribution cables.

Our Unit Power Centre Boards allow for ready extension.

Fuses which emit flame when operating are unsound in iron cases.

Use "Aeroflex" Fuses.



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POWER FACTOR IMPROVEMENT

BY INSTALLING REASON MAXIMUM DEMAND INDICATORS ON A.C. POWER SERVICES : AND INTRODUCING A K.V.A. MAXIMUM DEMAND TARIFF.

STANDARD THERMAL INSTRUMENT

(Approved by Electricity Commissioners).

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Delivery of wiring materials, tapes and flexible cords is important to you. Important for many reasons.

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Stocks of materials in general demand are held at our sixteen stores.

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utilise them with the aid of

QUICKFIX GALLERIES.

DON'T HAVE BROKEN SHADES—

Avoid rims and lips breaking by STANDARDISING THE QUICKFIX SELF-ADJUSTING INTERNAL GRIP-GALLERY.

The steel band spring automatically deals with the expansion of shade, and the three lugs attached thereto provide an efficient support.

There are no screws to become lost, stripped or corroded.

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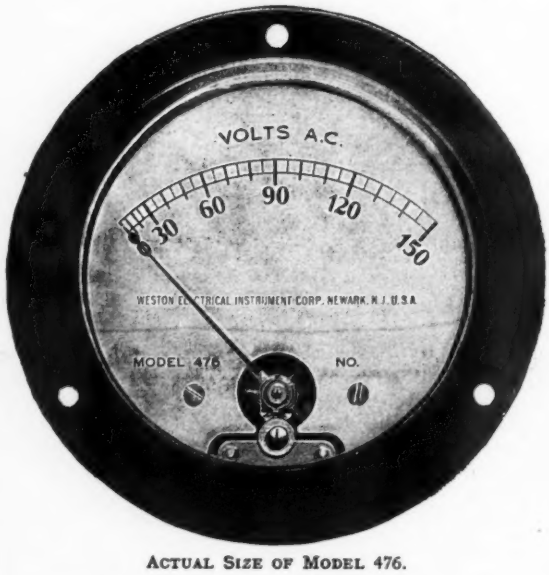

ACTUAL SIZE OF MODEL 476.

MODEL 476.		MODEL 517.	
Case Diam.:	2'56"	Case Diam.:	2'06"
Flange Diam.:	3'25"	Flange Diam.:	2'56"
Depth:	1'63"	Depth:	1'72"
Scale length:	2"	Scale length:	1'5"

List Price from 40s.

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SMALL PANEL INSTRUMENTS FOR ALTERNATING CURRENT

These New Models create a new standard for small A.C. Instruments, and are in a class alone for design, performance and finish.

They can only be compared with our well-known Models 301 and 506, for D.C. service, and we are confident that their performance under the severest service conditions will quickly gain for them the same reputation that our small D.C. Models have held ever since their introduction some years ago.

THE SPECIAL FEATURES OF THESE TWO NEW MODELS ARE:

Low Power Consumption. **Excellent Damping.**
High Sensitivity, *i.e.*, 6 mA for 300 volt range and approximately 9 mA for 150 volt range.
Accuracy 2 per cent. for A.C. (commercial frequencies), and also suitable for D.C. circuits.
High Self-Contained Range, *i.e.*, up to 300 volts.
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PRACTICALLY
ALL THE SHIPS IN
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"BATTLESHIP QUALITY," THERE IS NO HIGHER GRADE.

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Another year passes—with pardonable pride we look back on the achievements of the last 35 years seeing many improvements and many changes—the milestones of progress—but constant still we see maintained in our products to-day, those traditional standards of quality, which we set for ourselves at the beginning, and from which we have never permitted, and never shall permit, the slightest deviation. It pays to make a good job.

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If all engaged in the Electrical Industry, combined to set a higher standard of workmanship throughout the trade, a great move would be made towards the assurance of its continued prosperity, and the millstones of public antipathy and tripidation would no longer be hung around its neck to hamper and delay its future success. It pays to make a good job.

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Makers of

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famous in 1892—famous to-day.

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"We have in our work used your Insulation MEG Tester and are very satisfied."
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SAFETY FIRST TRADE MARK

The "S.F." 15-amp. Quick-Break Plug has special features that should recommend it to users.

The Plug will take any size of flexible cord to 162/36. Provides a firm grip and will carry 15 amps. without heating.

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2-PIN and EARTH QUICK-BREAK WALL PLUG (15 amps.)
EASILY WIRED. UNBREAKABLE.

No. S.F./30 2-PIN and EARTH HANDSHIELD PLUG moulded from Heat-Resisting, Non-Softening High Insulating Material. Price **7/-** *subject.*

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For the heavy current flexible cords suitable for above plug, and all other purposes, see our Catalogue W215 – on request.

For fuller particulars see "S.F." Circular—sent on request.

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ELECTRICAL SOLDERING IRONS

ALL SIZES, FOR ALL PURPOSES.

COMBINE **SPEED, CLEANLINESS** AND **RELIABILITY.**

TRY THEM and PROVE THEIR WORTH.

Guaranteed for SIX Months.

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ST. MARTIN'S AVENUE,
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Modern Design.

FIT BALL OR ROLLER BEARINGS BUT FOR MAXIMUM SERVICE — SPECIFY — R & M Bearings

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"The Lamp with Two Skins."

GIVES LIGHT WITHOUT SHADOW OR GLARE.

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- - FOR MAIN AND SIDE STREET LIGHTING - -

GREENOCK.

All the essential features of modern street lighting requirements are embodied in the design of E.L.E.C. Fittings, backed with over 30 years experience. Substantial and ornamental design, efficient light distribution, ample ventilation.

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For positions where vibration is experienced use Anti-Vibration Discs. All E.L.E.C. Fittings can be supplied with A.-V. Discs when required.

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WRITE FOR CATALOGUE No. 8—

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74,460 Sq.-Ft. More Floor Space

for the Manufacture of

TRADE SIROCCO MARK

PRODUCTS.

EXTENSIONS covering 74,460 square feet of floor space have recently been added to the Sirocco Engineering Works in order to cope with the increased demand for Sirocco Fans and Tea Machinery, as well as for the Davidson Flue Dust Collectors.

DAVIDSON & Co., Ltd.,
SIROCCO ENGINEERING WORKS,
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A New Product of Craftsmen

THE CRABTREE "H.O." SWITCH - LAMPHOLDER.

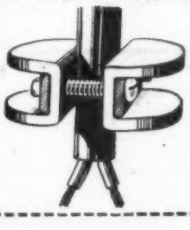
We would remind our readers that the Cord Grip feature of the above is identical to that of the recently introduced "H.O." Lampholder.

It consists of two brass clamp-plates, leather-padded, which grip the flex and transfer weight and strain from the points of connection. The grip—which can be used with any thickness of flex—is adjusted by two screws, burred to prevent loss or complete removal.

We illustrate this feature below.

J. A. CRABTREE & Co., Ltd.,
"Craftsmen in Switches."
Lincoln Works, WALSALL.

The Cord Grip Feature.



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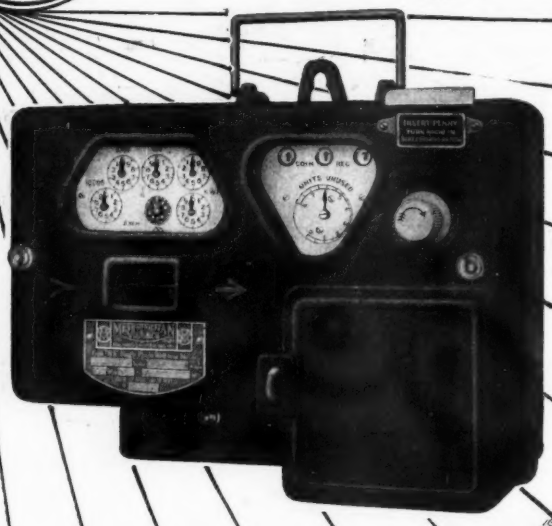
Outstanding merits of "Metrovick" Type NA PREPAYMENT METERS

SPECIAL ATTENTION IS DIRECTED TO THE POINTS DETAILED IN THE SHADED SQUARES



LIGHT WEIGHT
Weighs only 18lbs.

SIMPLE WIRING
Exactly similar to that of standard meter.

MINIMUM FRICTION
The design of the moving parts is such as to reduce friction losses to a negligible value.

EASY PRICE CHANGE
The rate per Unit can be changed in two minutes on site by an unskilled man.

GOOD WORKMANSHIP
Sound materials. High grade workmanship, inspection and finish throughout.

RELIABILITY IN SERVICE
Actual experience shows that this meter can be thoroughly depended upon in service.

CONTACTOR SWITCH
The switch embodies the well known rolling contacts of the contactor type, and they cannot stick.

INTER-CHANGEABILITY
Jig-made parts interchangeable with other Type NA meters avoids need for large stock of parts.

FRAUD PROOF
Where necessary the cash side is sealed separately from the meter and recording side.

WILL NOT TRIP PREMATURELY
External vibration does not effect the trip until all prepaid energy is consumed.

ENCLOSED SWITCH
The Contactor Switch is enclosed in Flameproof Arc Shields.

ACCURACY AT FRACTION OF LOAD
Sensitive design and perfect balance ensures complete accuracy at one-twentieth of load.

NO COIN JAMMING
Construction makes coin-jamming almost impossible, and all coins must drop into the money box.

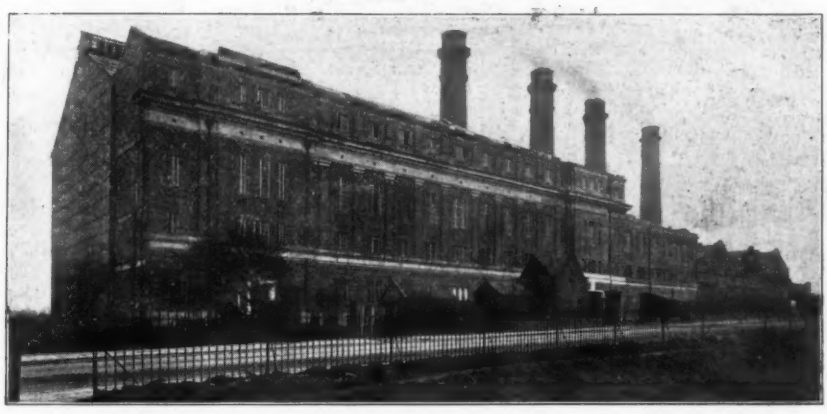
HIGH CAPACITY SWITCH
Supplied with 20 amp. or 40 amp. Switch. Latter suitable for large Cooker load.

SIMPLICITY
The design of the mechanism is very simple, and can be easily understood by looking at it.

METROPOLITAN Vickers ELECTRICAL CO. LTD.

TRAFFORD PARK - MANCHESTER

G
P05



Lister Drive Power Station Extension, Liverpool.

LIGHTING A POWER STATION

25,000 yards of "Maconite" Insulated Cables, braided and compounded, are installed in tubing in the newest extension to the Lister Drive Power Station, Liverpool. The Corporation Electricity Supply Department, who carried out the work, have had wide experience of "Maconite" Cables for many purposes. It is therefore significant that they use them for their own power station, where they will be subject to the varying temperature and exacting conditions of the boiler and turbine houses.

The condensation and subsequent rust which takes place inside the tubing, especially in such situations as this, leaves the "Maconite" entirely unaffected.

For all difficult situations use

"Maconite"

INSULATED CABLES

REG^{D} TRADE MARK N^{o}464448

THE MACINTOSH CABLE CO., LTD., DERBY.

LONDON : St. James's House, St. James's Street, S.W.1

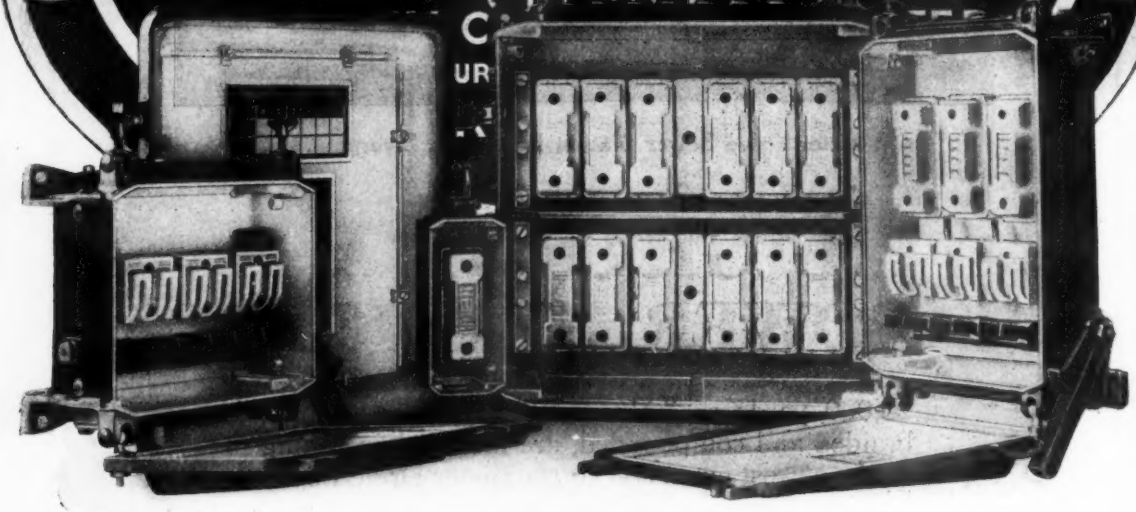
M. 171.

Look for *the label!*

MANUFACTURED UNDER SIMPLEX PATENTS

SIMPLEX

STANDARD
DISTRIBUTION & SWITCH GEAR



Soundest value,
surest satisfaction

—that's SIMPLEX. Never before has such a staunch and sturdy embodiment of efficiency been put before the buyer of Switch and Fuse Gear. Built into SIMPLEX are new and fundamental features which have revolutionised ideas of construction and *value*.

Switches have—

An instantly-removable blade mechanism.

Special arc-damping detachable shields, making either "top" or "bottom" wiring remarkably simple.

Patented rigid handle fixing of *malleable* iron.

Operating mechanism of rust-proofed hardened steel, powered by strong *compression* springs. *No tension springs.*

Fuse Boards have—

An *exclusive* patented method of making mains connections.

Fuse bank supports of bakelite-insulated duplex steel rods, ensuring infinite insulation resistance.

Hinging brackets of rust-proofed pressed steel, with self-retaining screws.

Pressed steel hinge lugs on case, giving added strength.

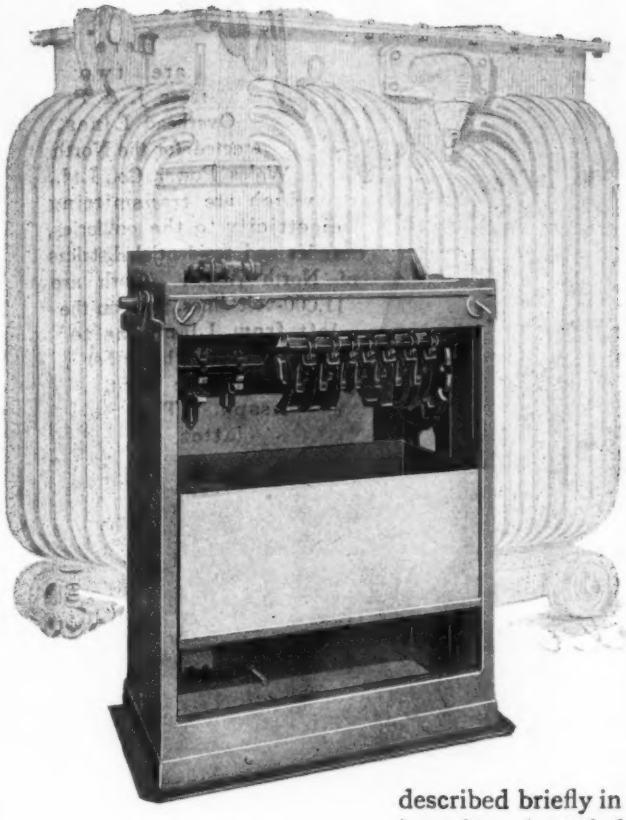
The fuse unit built into all SIMPLEX gear is proved by official tests to be of ultra-efficiency—it possesses a truly amazing margin of safety. All components are interchangeable, making for economy, ease, and speed in replacing parts. *Full details of Switches, Switch-fuses, Distribution Boards and Cut-outs are given in List No. 1127 (sent on request).*

SIMPLEX CONDUITS LTD.,

Head Office & Works: GARRISON LANE, BIRMINGHAM.

Also at London, Glasgow, Manchester, Sheffield, Liverpool, Newcastle, Leeds, Bristol, Cardiff, Nottingham, Belfast, and in principal Colonies.

Control of Voltage and Power Transmission



The ideal system
of
changing transformer tappings under load.

(1) No switchgear in transformer tanks.

(2) A self-contained regulator without electrical interlocks and applicable to any transformer.

(3) Suitable for both small and large schemes, giving ± 10% regulation or more, up to 90,000 K.V.A.

(4) Operated by hand, by remote push button, or according to load conditions by automatic relays.

(5) A system proved by the severest tests before and in service.

The Brookhirst solution of the problem of voltage regulation on interconnection schemes, is described briefly in Pamphlet 183C. Over 150 regulators have been installed during the last seven years on transmission schemes up to 33,000 volts.

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Essex House, Temple Street, Birmingham.
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Here are two more J. & P. Overhead Lines, erected for the North Wales Power Co., Ltd., which are transmitting electricity to the collieries, quarries and residential districts of North Wales. Both are 11,000-volt lines, that on the left from Llandulas to Old Colwyn, the other from Abergele to St. Asaph. The latter

JOHNSON & PHILLIPS LTD.

Home branches in London (City), Birmingham, Bristol, Cardiff, Derby, Glasgow, Ipswich, Liverpool, Manchester, Newcastle-on-Tyne, Portsmouth, Southampton, Belfast.

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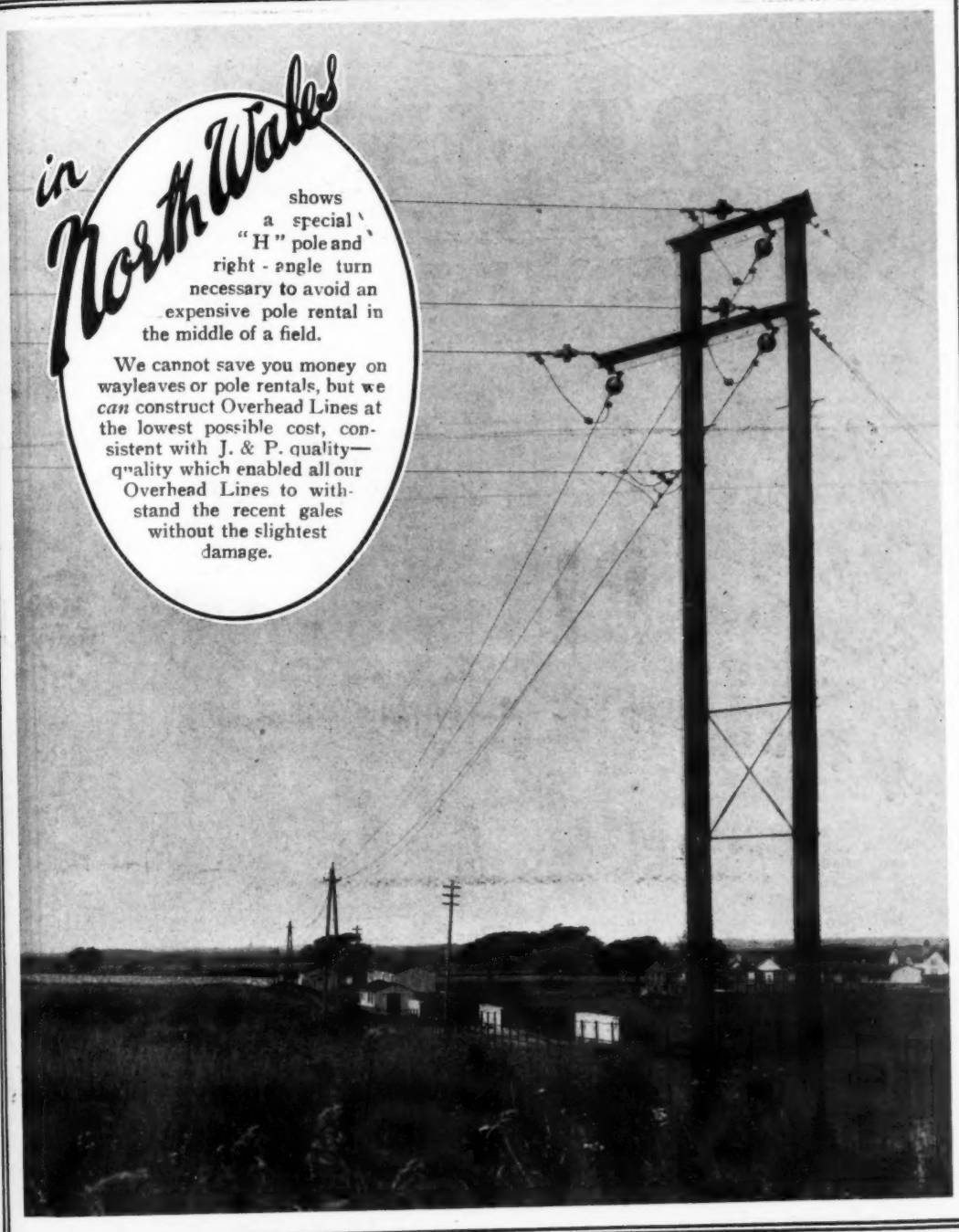
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shows a special "H" pole and right-angle turn necessary to avoid an expensive pole rental in the middle of a field.
We cannot save you money on wayleaves or pole rentals, but we *can* construct Overhead Lines at the lowest possible cost, consistent with J. & P. quality—quality which enabled all our Overhead Lines to withstand the recent gales without the slightest damage.

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EVERYTHING The G.E.C. your guarantee ELECTRICAL

The "D.B.MAJOR"

Quick Make & Quick Break

SWITCH WITH FUSES

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This latest addition to the "D.B." range embodies the well-known features of reliability, robust construction and positive quick make and quick break. It is especially suitable for domestic heating and cooking services and for general use on 500 volt industrial motor circuits.

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THE GENERAL ELECTRIC CO., LTD.

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Branches throughout Great Britain and in all the principal markets of the world.

VALUATIONS and AUCTIONS
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Electrical Works, Plant & Stock.

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46, Watling Street, London, E.C.4. — **16, Albert Square, Manchester.**

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Important Eight Days' Sale of the
ENTIRE CONTENTS of the GLOBE IRON WORKS of JOHN MUSGRAVE & SONS, LTD., BOLTON, LANCS.

MESSRS.

FULLER, HORSEY, SONS & CASSELL

will SELL by AUCTION, in LOTS, on the premises, on TUESDAY, JANUARY 31st, 1928, and following days, at eleven o'clock precisely each day,

HIGH-CLASS MACHINE TOOLS,

including 70 Screw-cutting and other Lathes, ten combination and other Turret and Capstan Lathes by Herbert, Brown and Sharpe, &c., Potter & Johnston, and Cleveland Automatics, 24 horizontal and vertical Milling Machines, by Brown and Sharpe, Le Blond, Kendall & Gent, Becker and others, four plano-type ditto, nine Planing Machines up to 30 ft. by 10 ft. by 10 ft., six side Planers up to 13 ft. by 9 ft. 6 in., seven universal, plain and surface Grinders, by Brown & Sharpe, Norton, Churchill, &c., disc and tool and cutter Grinders various, ten Pearn-Richards No. 4 and other horizontal Boring Machines, nine duplex and other vertical Boring and Turning Mills, by Bullard, Richards, &c., 25 radial, pillar, and sensitive Drilling Machines, Noble and Lund 48 in. Band Saw, Haigh 7 ft. Broaching Machine, Richards' Key Seater, Power Hack Saws.

FOUNDRY PLANT,

including six Cupolas, two Bonvillain hydraulic Moulding Machines, 8 ft. Loam Mill, four Loam Mixers, Wright tilting Furnace, Foundry Boxes, Ladles, &c.

SHEET METAL PLANT,

including 6 ft. and 3 ft. power Guillotines, two power Stamping Presses, Rhodes' 48 in. Circle Cutter, 6 ft. Folder, Rhodes' Nibbler, Tinmen's Rolls, Swaging Machines, Acetylene Plant, &c.

WOOD-WORKING MACHINERY,

including two Robinson 24-in. Circular Saw Benches, two 30-in. Band Saws, two Robinson 24 in. by 6 in. Planing and Thicknessing Machines, 24 in. and 12 in. overhead Planers, Oliver 36 in. double disc Sander, Saw Filing, Plane Iron and other Grinding Machines, universal Trimmers, &c.

MOTIVE POWER,

including Forty 460-volt d.c. Motors, 5 h.p. to 140 h.p., Forty-three 400/440-volt a.c. Motors, 3-phase, 50 periods, 7½ h.p. to 200 h.p., Crompton 6¼ kVA, 440-volt, 3-phase Alternator, 12-kW, 110-volt Motor Generating Set, Lancashire boiler by Musgrave, 8 ft. by 30 ft. (170 lb. w.p.), with superheater, Green's 120-tube Economiser, Bennis Coal Elevator.

MISCELLANEOUS PLANT.

A 20-ton Wagon Weighbridge, 12 Avery Weighing Machines, 5 cwt. to 3 tons, Musgrave 2-stage Air Compressor, Broom and Wade 2-cylinder Compressor, Air Receivers, Massey 1 cwt. Pneumatic Hammer, 100-ton hydraulic Mandrel Press, Dorman Die Casting Machine, two Monometer Metal Furnaces, Avery 30-ton universal Testing Machine, Izod Impact Tester, Newall 4 ft. Measuring Machine, Air Pump and Pipe Testing Plant, Bar Stretching, Bending, and Straightening Presses, Laboratory Apparatus, Gas Furnaces, Heating Plant, Tanks up to 37 ft. by 32 ft. by 3 ft., Pumps, Fans and Blowers, Cylinder Boring Engines and Bars, Marking-off Tables, Hydraulic Jacks, Engineers' Small Tools, Shafting, Belting, Winches, Baulk Timber, &c.

STORES AND MATERIALS,

including new Plummer Blocks and Shafting, Fittings, Tool and Mild Steel, Metal Bars various, Nuts, Bolts, Tinned and Black Steel Sheets, Pig Iron, Electrical Fittings, and large quantity

NON-FERROUS METAL AND WROUGHT AND CAST SCRAP.

Office Furniture, including Typewriters, Time Recorders, five Dictaphones, Safes, Drawing Office equipment, two Kodak Photostats, and numerous other effects.

May be viewed on production of catalogue to be obtained (when ready) of

MESSRS. FULLER, HORSEY, SONS & CASSELL,
Mechanical Auctioneers and Valuers, 11, Billiter Square, E.C.3.

TO USERS OF STEAM POWER.—Messrs. FULLER, HORSEY, SONS & CASSELL will include in the above Sale a new 450-h.p. COMPOUND TANDEM HEAT EXTRACTION ENGINE by Musgrave, cylinders 18½ in. and 29 in. by 2 ft. (working pressure 170 lbs.) with Jet Condensing Plant.

Catalogues may be had as in the preceding advertisement. 855

SITUATIONS VACANT.

Latest time for receiving, 5 p.m. Tuesday

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

Original Testimonials should never be sent.

COUNTY BOROUGH OF ST. HELENS.

Vacancy for Charge Engineer.

APPLICATIONS are invited from qualified Mechanical and Electrical Engineers for the position of Charge Engineer at the Croppers Hill Power Station of the St. Helens Corporation.

The applicant must be fully experienced in the most efficient methods of running and maintenance of modern boiler and turbine plant, and be able successfully to take complete charge of the whole plant when on duty.

He must be of strong character, used to the correct control of men, and in every way capable of obtaining the very best all-round results.

Remuneration and conditions of employment will be in accordance with Grade 8, Class E, of the National Joint Board schedule and conditions.

Applications, giving full particulars of age, education, technical training and experience, accompanied by not more than three copies of recent testimonials, to be sent to the undersigned not later than the 12th January, 1928.

F. N. RENDELL-BAKER, A.M.I.E.E.,
Engineer and Manager.

Municipal Electric Supply Dept.,
St. Helens.
20th December, 1927. 840

BARKING TOWN URBAN DISTRICT COUNCIL.

Electricity Department.

SHOWROOM ASSISTANT.

APPLICATIONS are invited for the appointment of a Showroom Assistant in the Electricity Department of the Council.

Applicants must have had experience in a similar capacity.

Commencing salary £200 per annum, plus house, fuel and light.

The person appointed will be required to contribute to the Council's Superannuation Fund and to pass a medical examination.

Applications, together with copies of two testimonials, stating age and date when duties could be commenced, should be forwarded so as to reach the undersigned not later than 5 p.m. on Tuesday, the 10th January next.

Canvassing, either directly or indirectly, will disqualify.

By Order of the Council,
H. HARGREAVES,
Clerk.

Public Offices, Barking.
19th December, 1927. 831

CITY OF SHEFFIELD.

Electric Supply Department.

SALES ASSISTANT.

APPLICATIONS are invited for the position of Sales Assistant in the Installation and Motors Department, at a salary in accordance with Grade 9.A, Class H of the National Joint Board Schedule. (January rate £274 6s. 1d. net.)

Applicants must be able to estimate for installations for light, heat and power, and must have had previous experience in advising prospective consumers and in the supervision and carrying out of installation work.

Applications, stating age, full particulars of experience, together with copies of recent testimonials, to be addressed to the undersigned, endorsed "Sales Assistant" and to be received not later than January 10th, 1928.

S. E. FEDDEN,
General Manager and Engineer.

Commercial Street,
Sheffield. 857

ASSISTANT METER SUPERINTENDENT.

ASSISTANT Meter Superintendent required. Sound technical training and practical experience with d.c. and a.c. house-service meters (including polyphase) and switchboard instruments essential. Previous experience in the administration and control of a supply authority's meter department desirable. Salary and conditions of service in accordance with the N.J.B. Schedule of Salaries, Class G, Grade 8 (at present approx. £383 per annum).—Applications, giving full particulars of technical training and previous experience, together with copies only of testimonials, to be addressed to Engineer and Manager, 27, Osborn Street, Stepney, London, E.1, not later than Thursday, January 12th, 1928. 862

SITUATIONS VACANT.—*Continued.*

BOROUGH OF ROYAL TUNBRIDGE WELLS.

Electricity Department.

METER MECHANIC. First class Meter Mechanic required immediately, with experience in overhauling and repairing a.c. single and three-phase meters. Schedule wages 75s. 5d. per week, less superannuation contributions.

ENGINE DRIVER required immediately, thoroughly experienced in high speed turbine work (preferably Brush machines). Schedule wages 67s. 9d. per week, less superannuation contributions.

Applications with full particulars and stating when duties can be commenced, together with copies of testimonials, to be addressed to the undersigned.

R. N. TORPY,
Borough Electrical Engineer.

Electricity Works,
Tunbridge Wells. 866

ELECTRIC HEATING AND COOKING.

SHOP Foreman required for assembling Electric Cookers of all types. Must have long experience in this branch and be good disciplinarian.

Apply 788, Electrical Review, 4, Ludgate Hill, London.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

COMMERCIAL Manager wanted by manufacturer of electric cookers and electric fires. Applicants must have extensive acquaintance with large buyers and corporations.—Apply, stating age and experience, to 5093, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN for d.c. motors and generators wanted by N.E. Coast firm.—Only men experienced in this work need apply to 853, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN, Senior, having first-class experience of electric controllers, auto-starters, and contactor type control gear.—Apply, stating age, experience, and salary required, to 847, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN required for Midlands, for the layout of electrical equipment of locos and motor coaches. Apply, stating age, experience, and salary required.—757, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMAN, junior, with experience of automatic control gear, low tension.—873, Electrical Review, 4, Ludgate Hill, London.

DRAUGHTSMEN. Must be fully experienced in general cooking and heating apparatus.—State age and full experience to 842, Electrical Review, 4, Ludgate Hill, London.

ENGINEERING Works in Lancashire require Male Testers, possessing technical knowledge, for instrument and meter work.—Apply, with particulars of age, training and experience, to 841, Electrical Review, 4, Ludgate Hill, London.

ENGINEER Salesman required, resident London, for centrifugal oil purifiers, &c. Must be expert Salesman and Organiser, and technical knowledge essential. Salary and commission, with prospects.—5012, Electrical Review, 4, Ludgate Hill, London.

JUNIOR and Senior Draughtsmen required, with experience in design and lay-out of electric control gear. State age, experience, salary required.—Address, "Electric," Wm. Porteous & Co., Advertising Agents, Glasgow. 5087

JUNIOR Draughtsman required by a firm of electrical switchgear manufacturers. Must be experienced in detailing and office routine.—Write, stating qualifications and particulars of age and salary required, to 868, Electrical Review, 4, Ludgate Hill, London.

KEEN young Man required as Assistant in Sales Department of electric wire and cable manufacturers. Preference given to one with previous experience.—Write stating age, qualifications and salary required, to Dept. T.F.M., The London Electric Wire Co. & Smiths, Ltd., Playhouse Yard, Golden Lane, E.C.1. 854

LADY Assistant wanted for electrical fittings showroom in West End London.—State wages and experience to 850, Electrical Review, 4, Ludgate Hill, London.

LARGE Electrical Manufacturing Company requires the services of a first-class Transformer Designer and Engineer.—Applications, stating full particulars of experience, including salary asked, to be sent to 823, Electrical Review, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

ENGINEERS as shown below required by the Government of Ceylon for the Electrical Department for three years in the first instance. In each case free passages are provided, and, in the case of married men, for wife and children also not exceeding four persons besides the candidate selected; and a rent allowance is paid if no quarters are available. ASSISTANT CIVIL ENGINEER. Grade I. (M.320.) Salary, £500-£46-£960 a year. Candidates, age 22 to 35, must be corporate members of the Institution of Civil Engineers or hold an Engineering Degree or Diploma recognised as granting exemption from sections "A" and "B" of the A.M.I.C.E. examination. They must be good draughtsmen and capable of designing and carrying out buildings, bridges and other engineering structures, preparing detailed plans, taking out quantities, and estimating. They must also have had experience in surveying and levelling. ASSISTANT ELECTRICAL AND MECHANICAL ENGINEER. (M.321.) Salary, £300-£25-£450-£30-£600 a year. Candidates, age 22 to 35, must have had technical training and experience in works and drawing office, and subsequent experience in the installation and operation of electric generator plant, distribution system, and also testing of electrical plant and machinery. They should also be corporate members, or persons qualified on attaining the prescribed age to become corporate members of the Institution of Electrical Engineers. Preference will be given to those who also have a knowledge of surveying and levelling, and experience of mechanical and civil engineering. ASSISTANT ELECTRICAL ENGINEER. (M.322.) Salary, £300-£25-£450-£30-£600 a year. Candidates age 22 to 35, must have had technical training and experience in works and drawing office, and subsequent experience in the installation and operation of electric generator plant, distribution system, and also testing of electrical plant and machinery. They should also be corporate members or persons qualified on attaining the prescribed age to become corporate members of the Institution of Electrical Engineers. MAINS ENGINEER. (M.324.) Salary, £600-£40-£1,000 a year. Candidates, age 30 to 45, should be corporate members by examination of the Institution of Electrical Engineers, and have had good technical training, as well as experience in the laying out of a.c. and d.c. mains systems, the laying of high-tension and low-tension cables, and the construction of overhead lines up to 33,000 volts, testing, &c., and maintenance of same. ASSISTANT ELECTRICAL ENGINEER, GRADE I. (M.325.) Salary, £500-£30-£920-£40-£960 a year. Candidates, age 25 to 35, must have had experience in the installation and operation of modern three-phase power supply system, including conversion to direct current for traction, &c. They should also have passed the examination for the Associate Membership of the Institution of Electrical Engineers or equivalent examination and be Associate Members of that Institution.—Apply at once by letter, stating age, qualifications, and particulars of experience to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1, quoting the reference number shown above against the vacancy for which application is being made. 845

LARGE manufacturing concern requires first-class Sales Organiser for their Radio Department. Exceptional opportunity for keen business man with good connections and knowledge of radio market.—Applicants should give fullest particulars of experience, age, salary, &c., to 861, Electrical Review, 4, Ludgate Hill, London.

LEADING firm illuminating engineers require services Two Representatives, Scotland and Wales, with technical training and electrical connections. Must be well educated.—Write, with full particulars, to 848, Electrical Review, 4, Ludgate Hill, London.

LINESMAN wanted by cable company; man having experience in the erection of low-tension distribution systems and steel poles. Some experience of the erection of e.h.t. lines would be a recommendation.—Apply, with full particulars of experience, wages required, &c., to 838, Electrical Review, 4, Ludgate Hill, London.

LIVERPOOL and District.—Non-Association Lamp Manufacturers desire to appoint a thoroughly experienced Representative for this district.—5062, Electrical Review, 4, Ludgate Hill, E.C.4.

REPRESENTATIVE wanted to work Midlands area.—Apply, in first instance by letter, to the Secretary, The Walsall Hardware Manufacturing Co., Ltd., Hatherton Works, Ablewell Street, Walsall. 846

REQUIRED by Supply Authority near London, Draughtsman in Mains Department. Rate £3 5s. per week.—Apply to 870, Electrical Review, 4, Ludgate Hill, London.

REQUIRED by Electric Supply Undertaking (Greater London No. 10 Area), Electrical Fitter. Present rate 1s. 8d. per hour.—Apply to 869, Electrical Review, 4, Ludgate Hill, London.

SALESMAN, young and energetic, for low tension automatic control gear, a.c. and d.c., London area.—872, Electrical Review, 4, Ludgate Hill, London.

TRAVELLER required for Midlands and the North by London electrical insulation firm.—Apply, giving full details of previous experience, &c., to 5057, Electrical Review, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

WANTED for India, an Electrical Salesman with full technical knowledge of all types of electrical plant and accessories. Unmarried. Age 26 to 30, 5 years agreement. Salary, Rs. 600 per month.—Apply in writing, with copies of testimonials, to Alex. Lawrie & Co., Ltd., 14, St. Mary Axe, London, E.C.3. 5085

WORKING Chargehand wanted for works in the North of England. Good opening for man with first-class experience in the manufacture of switch and control gear, also switchboards.—Only men of ability, able to control men and boys, need apply, enclosing copies of references and stating wages required, to 867, Electrical Review, 4, Ludgate Hill, London.

YORKSHIRE and Lancashire.—Live Representative required to take over good connection in lighting glassware and fittings. Expenses and commission.—State experience to 817, Electrical Review, 4, Ludgate Hill, London.

YOUNG Engineer, preferably of graduate standing, required as Technical Assistant in a large works manufacturing electric incandescent lamps. Applicants should have a sound electrical knowledge.—Apply, stating age and experience, to 5088, Electrical Review, 4, Ludgate Hill, London.

APPOINTMENTS FILLED.

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision. We will then insert a notice free of charge under this heading

BOYLAND, R. H., & Co. (Assistant Clerk); Box 648 (Wireman and Plumber Jointer).

SITUATIONS WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

A YOUNG Engineer (23), City and Guilds finalist; Stud. I.E.E., desires position, preferably electricity generation. Public school; 3 years engineering college; 3¼ years turbine works pupil; 8 months supply company.—5016, Electrical Review, 4, Ludgate Hill, London.

ADVERTISER (24), well educated, 5 years' electrical apprenticeship, theoretical knowledge, 2 years' experience largest liners, conversant wireless, seeks experience in showroom.—5113, Electrical Review, 4, Ludgate Hill, London.

AN Electrical Engineer (26), experienced winding, installation and breakdown work. Smart at fault locating and testing; a.c. and d.c.—5032, Electrical Review, 4, Ludgate Hill, London.

AN Electrical Engineer (22), full course certificate London Polytechnic, seven years with well-known firm in responsible positions, desires progressive position in technical, sales or estimating capacity. Not outside representative.—5018, Electrical Review, 4, Ludgate Hill, London.

AN Electrician, 1st class, capable in all branches, able to take charge; excellent references.—527, Kingsland Road, N.E. 5112

ARMATURE Winder, 12 years' experience. Repairs, rewinds; all types including car starters, dynamos.—Cobb, 11, Coliston Road, S.W.18. 5086

CABLE Works Manager (Engineer) desires position with reliable firm. Experience in rubber, bitumen, and paper insulation. Good organiser and excellent record.—5031 Electrical Review, 4, Ludgate Hill, London.

CLERK (30), seven years' experience large Power Company requires post. Rapid shorthand. Excellent testimonials Go anywhere.—5022, Electrical Review, 4, Ludgate Hill London.

CONTRACTING Engineer (33) seeks progressive position responsible capacity. Comprehensive and reliable experience as estimator, control of staff on installation large lighting, power, heating equipments. Abstainer.—5033, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer, age 25, single, public school, technical college and works training, and supply experience, seeks position. Available at fortnight's notice.—5028, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer, 35, skilled in management, organisation, estimating, sales and control of staff, desires change (preferably South). Present position Sales and Mains Engineer with Supply Company. Salary not less than £300 p.a. and according to conditions. Only first-class offer from Supply Company; consultant or well-known contractor will be considered.—5056, Electrical Review, 4, Ludgate Hill, London

SITUATIONS WANTED.—*Continued.*

ELECTRICAL Engineer (26), B.Sc., Eng., and college diploma, first-class experience in telephonic transmission and design of associated apparatus, desires change.—5052, Electrical Review, 4, Ludgate Hill, London.

ELECTRICAL Engineer Designer seeks responsible position, reliable and capable drawing office organiser and active leader. Thirty years' experience producing schemes and apparatus of commercial value; many patents. Excellent references and credentials. Present engagement expires 31st January.—5014. Electrical Review, 4, Ludgate Hill, London.

ELECTRICIAN (disengaged), young, fully experienced in power plant maintenance, lighting and heating; will go anywhere.—5061, Electrical Review, 4, Ludgate Hill, London.

ELECTRICIAN, returned from abroad, seeks situation, England; 13 years' experience plant and overhead mains. Good education. Any trial. Would suit works or institution. —5083, Electrical Review, 4, Ludgate Hill, London.

ELECTRICIAN (Improver), all systems, good knowledge a.c. power, seeks situation. Installation or maintenance.—5091, Electrical Review, 4, Ludgate Hill, London.

ELECTRICIAN-Wireman seeks situation, all systems.—A.E.J., 11, Southampton Buildings, Lymington, Hants. 5089

ENGINEER-Demonstrator-Salesman-Radiographer. Practical experience in X-ray and electro-medical apparatus. Requires change, responsible position.—5096, Electrical Review, 4, Ludgate Hill, London.

ENGINEER Designer, now employed with firm of switchgear manufacturers of world-wide reputation, desires change. Wide and intimate knowledge and practical experience of ironclad compound and oil-filled e.h.t. and super-tension switchgear.—5053, Electrical Review, 4, Ludgate Hill, London.

LATHE and Vice, experienced man seeks situation; first-class light mechanical work; used to small shop; excellent references.—5065, Electrical Review, 4, Ludgate Hill, London.

OVERHEAD Transmission Engineer seeks progressive position; 16 years' experience as estimator, designer, and control of staff on transmission, distribution, and telephone line construction. Free immediately.—5111, Electrical Review, 4, Ludgate Hill, London.

REPRESENTATIVE, well-known in Cable Trade, is desirous of fixing up with manufacturer, Continental preferred. Can advise on manufacture to any specification.—Apply 5030, Electrical Review, 4, Ludgate Hill, London.

REPRESENTATIVE (West of England), Electrical and Mechanical Engineer, seeks position or agency, estimating, supervision, sales; can provide office and showroom.—Thompson, 30, Elms Parade, Taunton. 5059

THOROUGHLY experienced Electrician requires berth. Town or country installation or maintenance. References —76, Granleigh Road, Leytonstone. 5017

TO Factors and Contractors.—A keen Salesman, Invoice, Order, and Despatch Clerk, 23, seeks progressive permanency. Excellent knowledge trade. Also C.M.A. experience.—5094, Electrical Review, 4, Ludgate Hill, London.

WIREMAN, experienced and reliable, wants situation.—G.P., 16, Cantrell Road, Bow, E.3. 5095

WIREMAN (young), used screwed or slip conduit, seeks situation; good references.—5092, Electrical Review, 4, Ludgate Hill, London.

YOUTH (17), well educated, desires Apprenticeship with good firm of electrical engineers. Moderate premium.—5037, Electrical Review, 4, Ludgate Hill, London.

FOR SALE.

Advertisements are inserted under this heading at 14s. per inch.

LAMPS.

Continental Manufacture.

METAL FILAMENTS, TRACTION, HALF-WATT TYPES. CLEAR, OPAL, COLOURED, FROSTED.

Quality Guaranteed.

Large Stocks carried of practically all Voltages and Wattages.

Enquiries (from Factors only) will receive prompt attention.

FRANK J. NATHAN & CO.,
43, 44 & 45, Great Tower Street,
London, E.C.3.

479

FOR SALE.—*Continued.*

MYLAN & SMITH (ENGINEERS), LTD.

KELVIN HOUSE,

St. James Street, Sheffield.

Every Item in our own Stock.

ALL Guaranteed for Six Months.

Thoroughly overhauled and tested before despatch.

THREE-PHASE, 50 PERIODS, 400/440 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
Three	45	940	slip-ring	Fuller
One	50	960	,,	,,
One	50	955	,,	Newton Bros.
Three	50	950	,,	Fuller
One	70	323	,,	Siemens
Two	125	485	,,	Brush
Two	200	733	,,	Newton Bros.
One	330	575	,,	Westinghouse
One	440	490	,,	E.C.C.
One	15	1440	squirrel cage	Newton Bros.
One	15	1440	,,	B.E.P.
Two	20	1420	,,	L. D. & M.
Three	50	964	,,	Newton Bros.
One	50	480	,,	L. D. & M.
One	60	965	,,	Newton Bros.
One	60	720	,,	L. D. & M.
One	75	970	,,	Newton Bros.

THREE-PHASE, 50 PERIODS, 500 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
One	50	955	slip-ring	Newton Bros.
Three	50	940	,,	Fuller
One	60	968	,,	Newton Bros.
One	75	323	,,	Siemens
One	125	485	,,	Brush
One	200	733	,,	Newton Bros.
One	375	575	,,	Westinghouse
One	26	575	squirrel-cage	B.T.H.
One	50	964	,,	Newton Bros.
One	55	2920	,,	Met.-Vick.
One	60	720	,,	L. D. & M.
One	75	970	,,	Newton Bros.

THREE-PHASE, 50 PERIODS, HIGH TENSION MOTORS.

Stock.	H.P.	Speed.	Volts.	Winding.	Maker.
One	65	1450	3000	slip-ring	English Elec. Co.
One	430	500	3300	,,	G.E.C.

DIRECT CURRENT, 110 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
Twenty-five	2½	410/475	shunt	G.E.C.
Thirty	3½	390	,,	,,
One	10	300	,,	Newtons, T.
One	24	280	,,	L. D. & M.

DIRECT CURRENT, 220/230 VOLTS.

Stock.	H.P.	Speed.	Winding.	Maker.
Twenty-five	4½	825/950	shunt	G.E.C.
Thirty	7½	780	,,	,,
One	19½	420	,,	E.C.C.
One	20	610	,,	Newtons, T.
One	20	300	,,	Vickers
Two	20½	370	,,	Laurence, Scott
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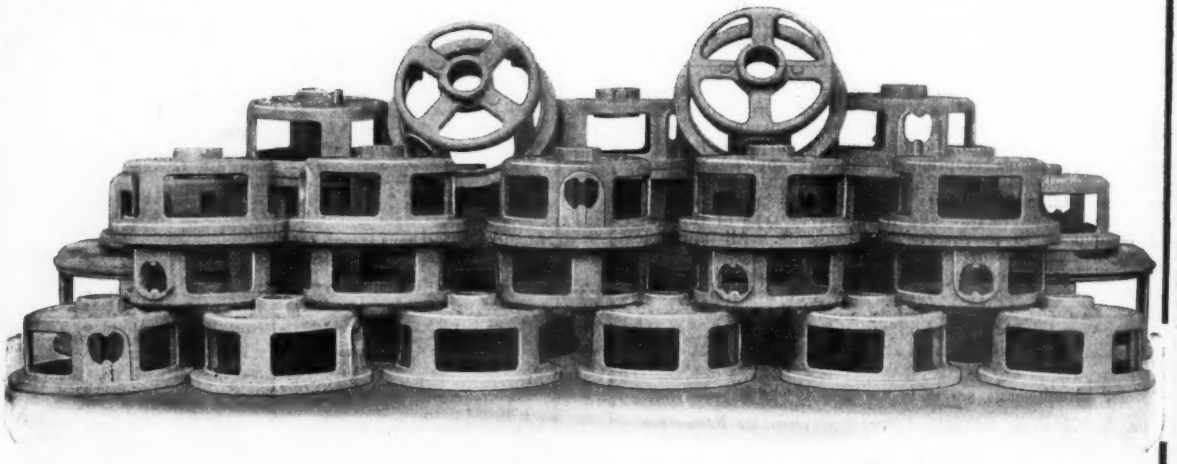

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With a view to making this side of the work of the Society more widely known among engineers, a limited number of copies of the Management Bulletin can be obtained on application, price sixpence each, post free. The Table of Contents of the first number is as follows:—

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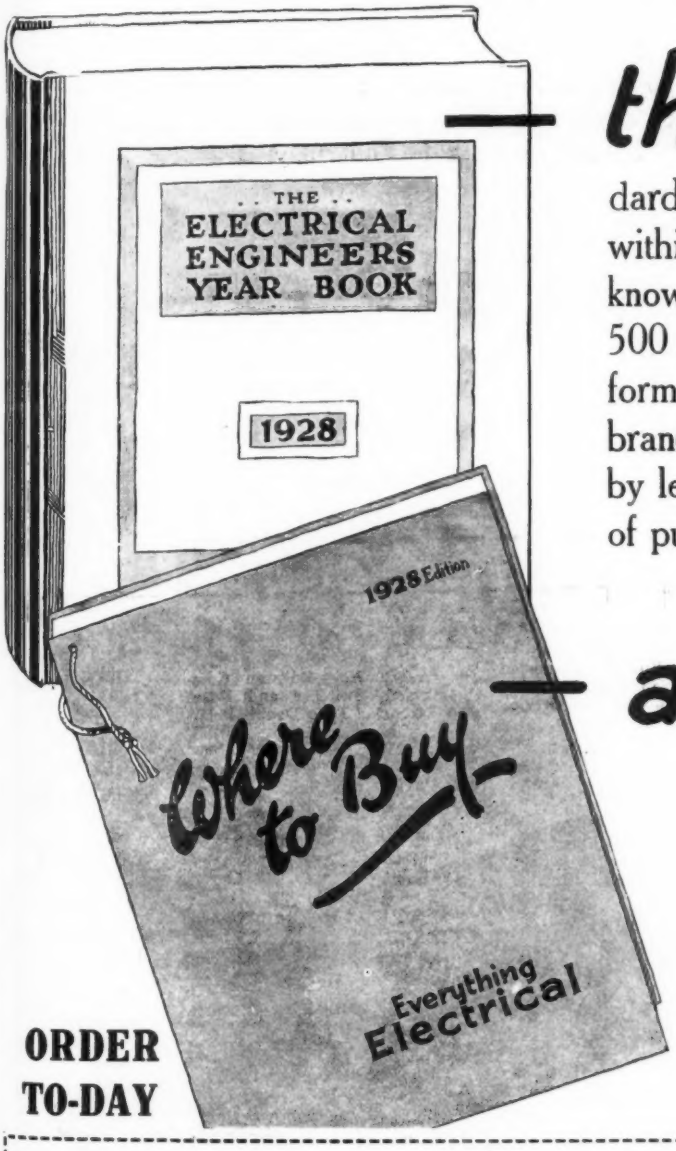

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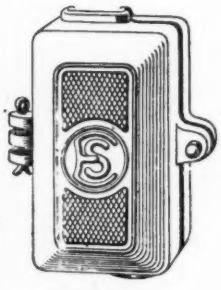

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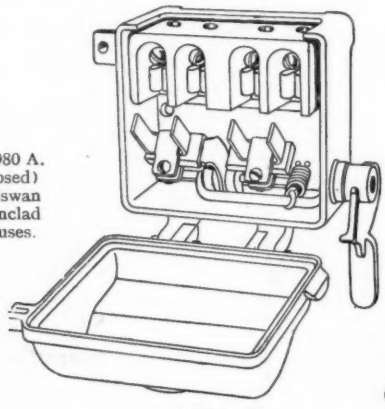

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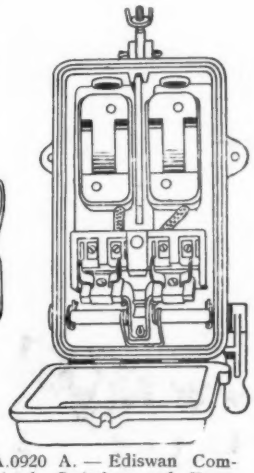

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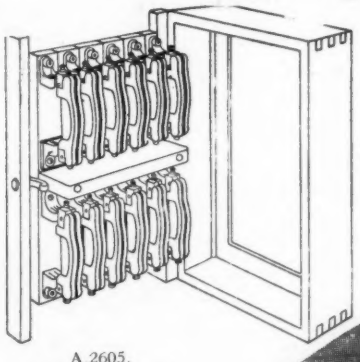

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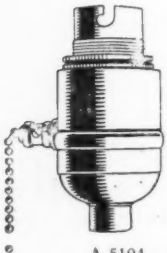

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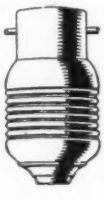

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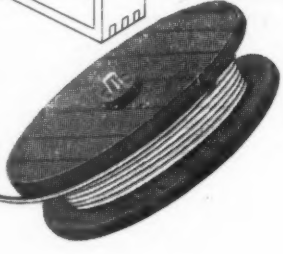

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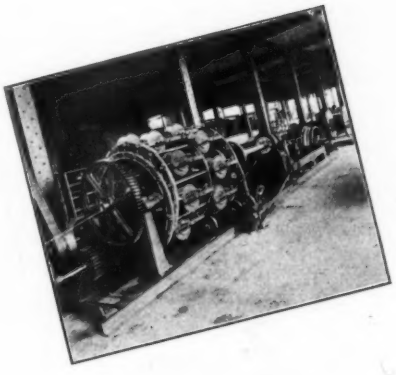

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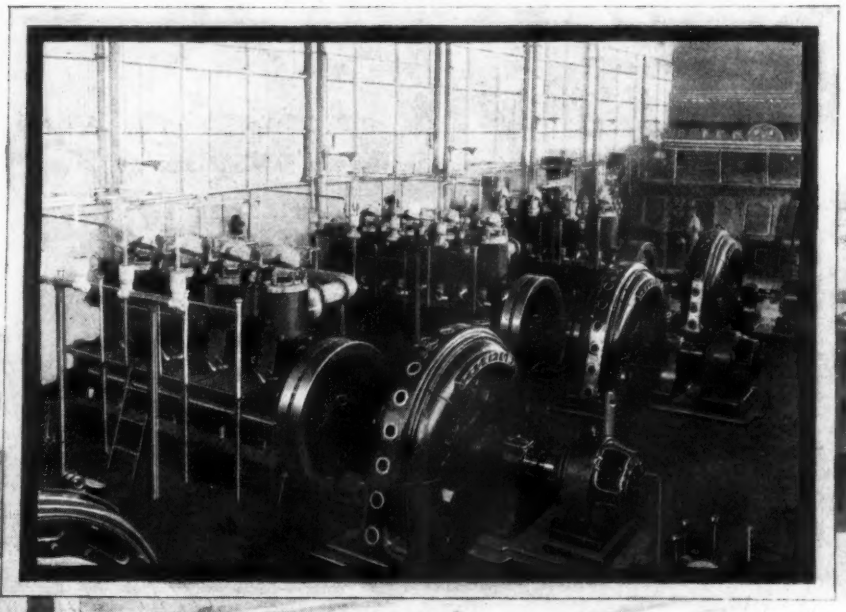

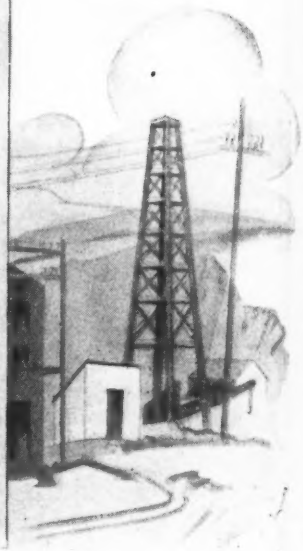

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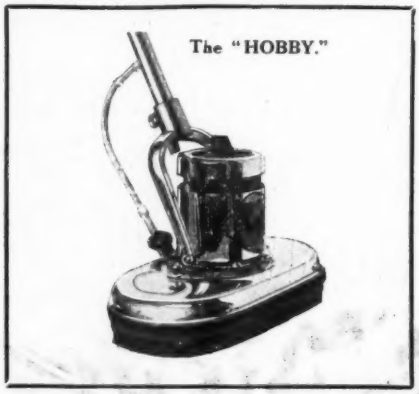
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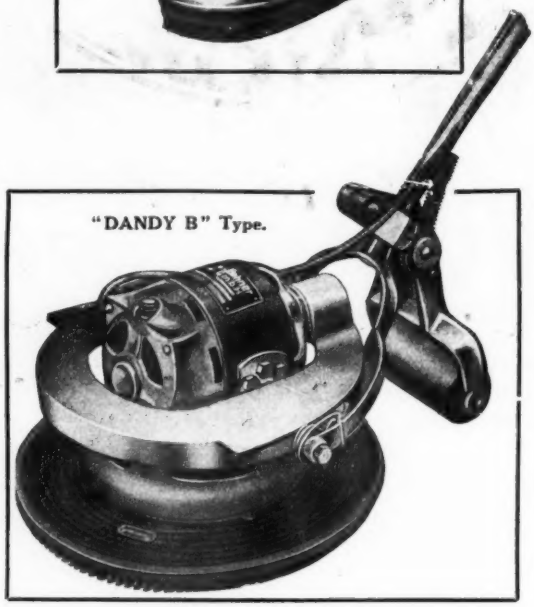
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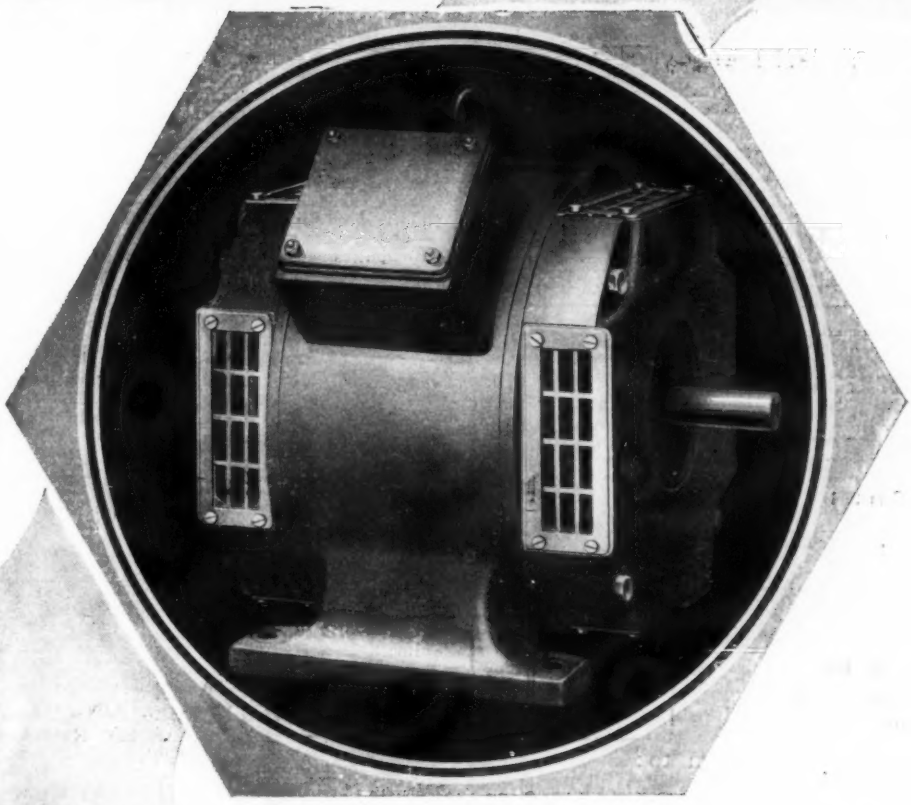

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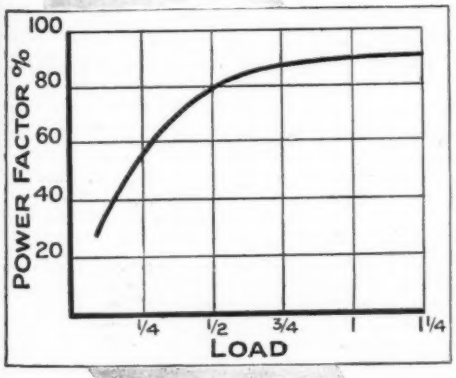

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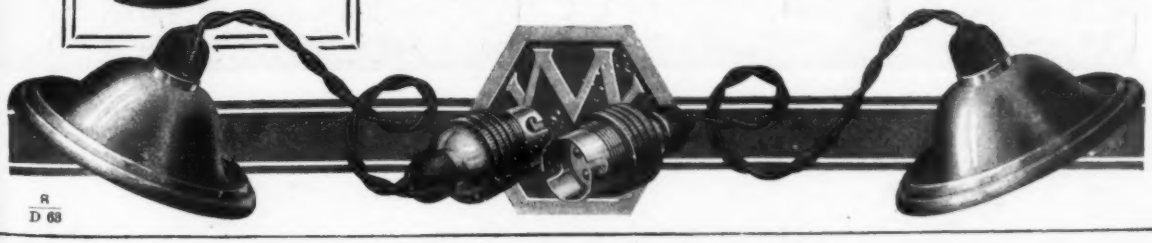

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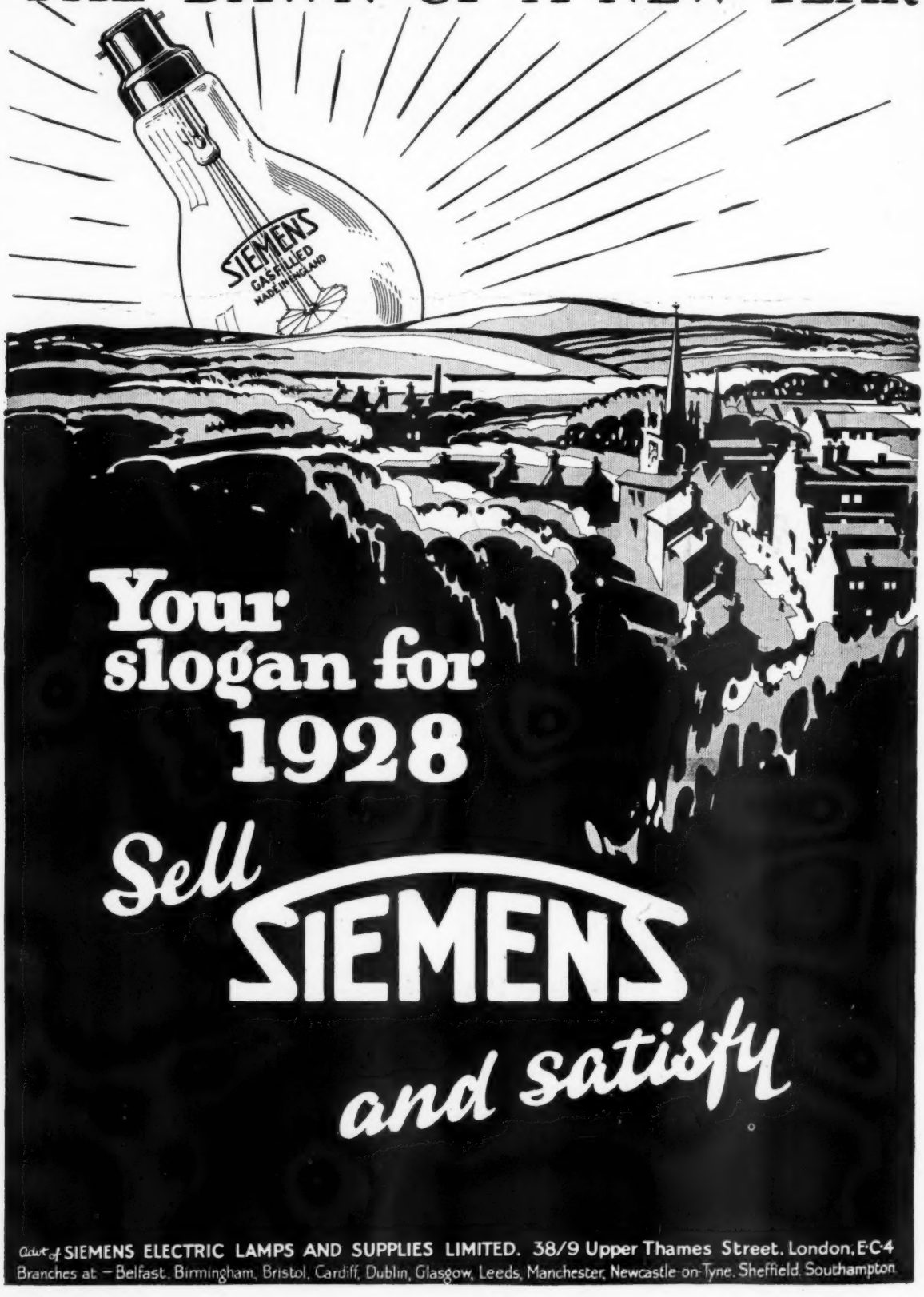

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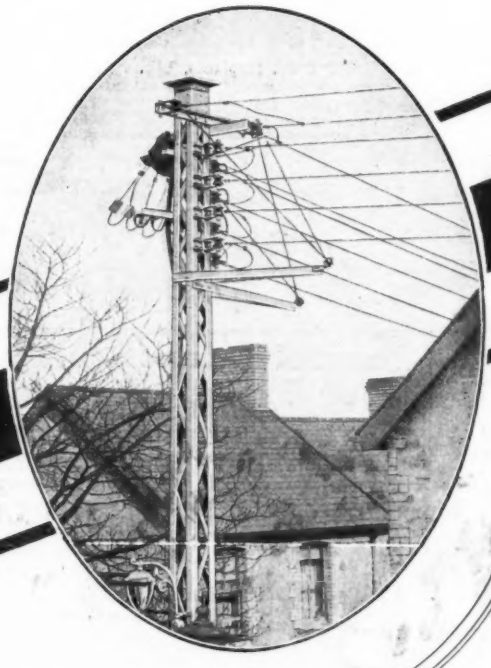

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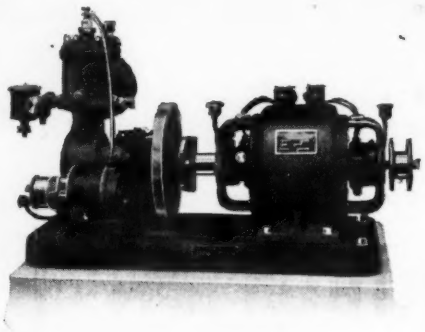

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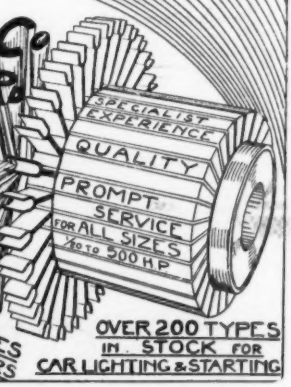

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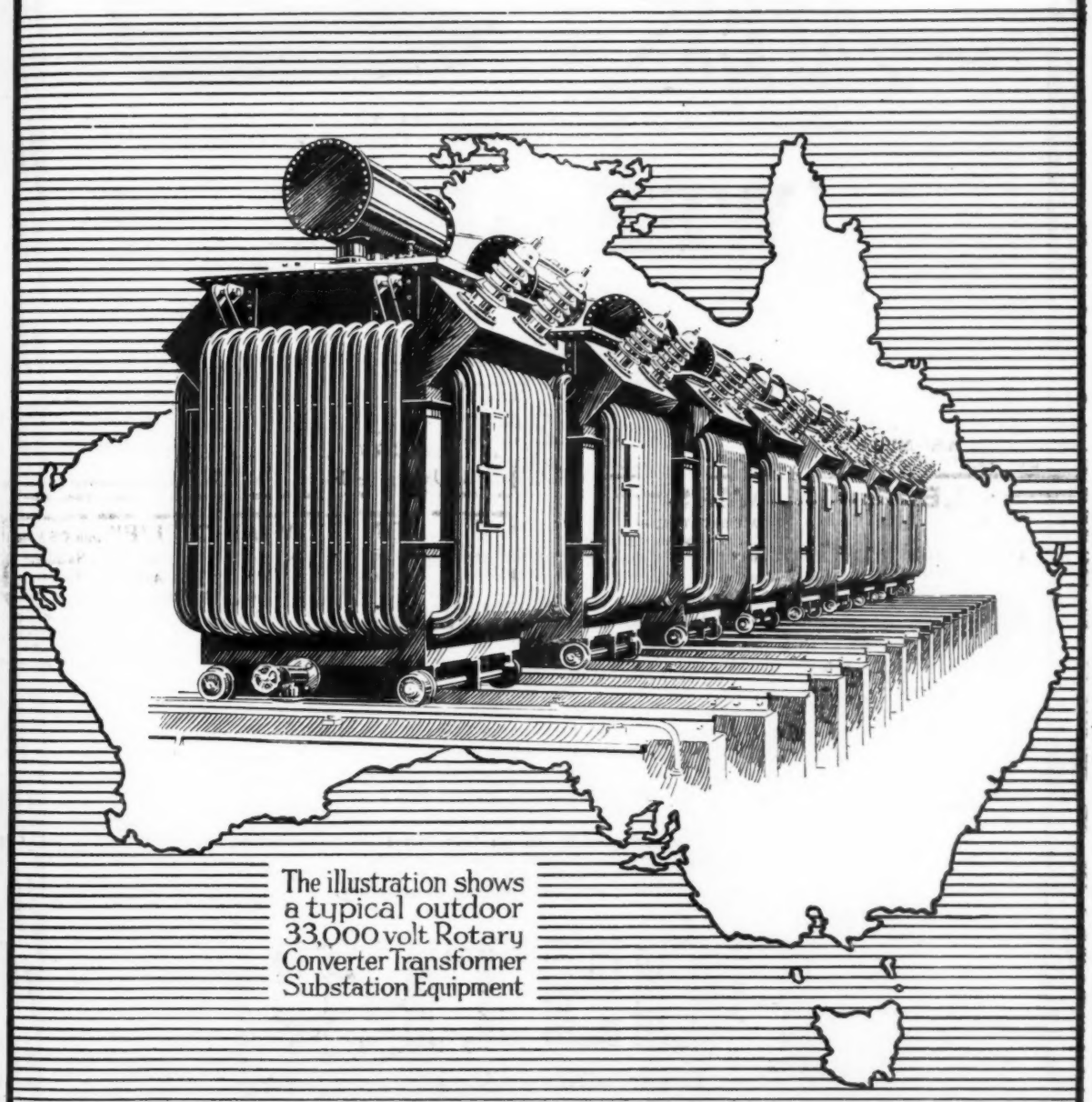

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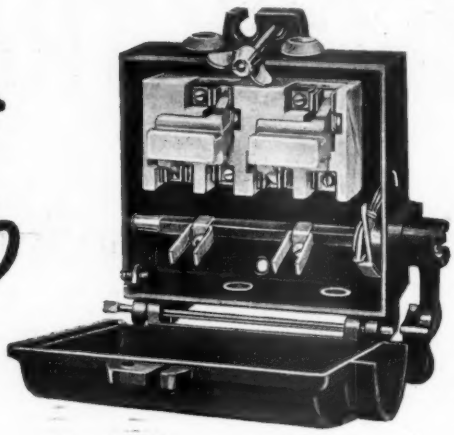

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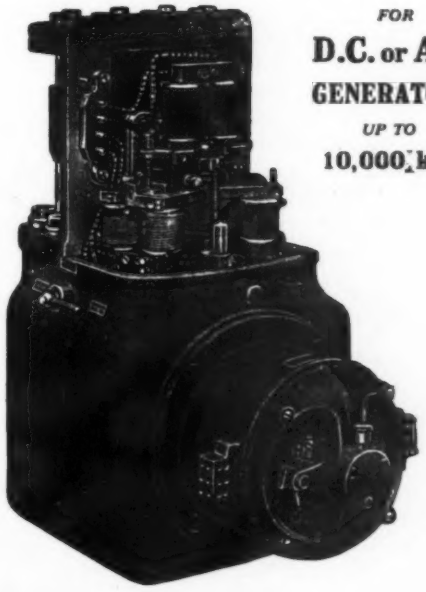

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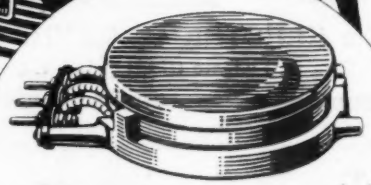

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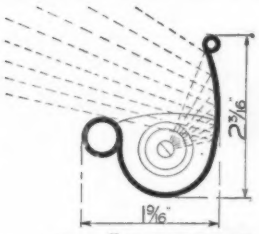

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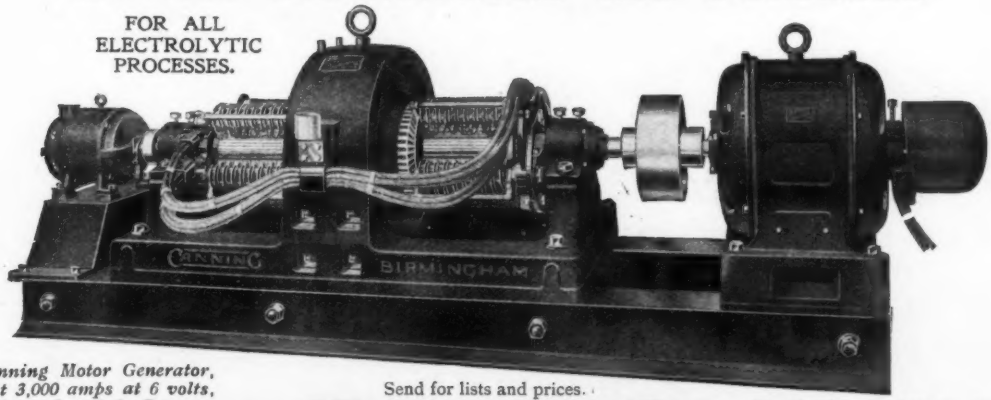

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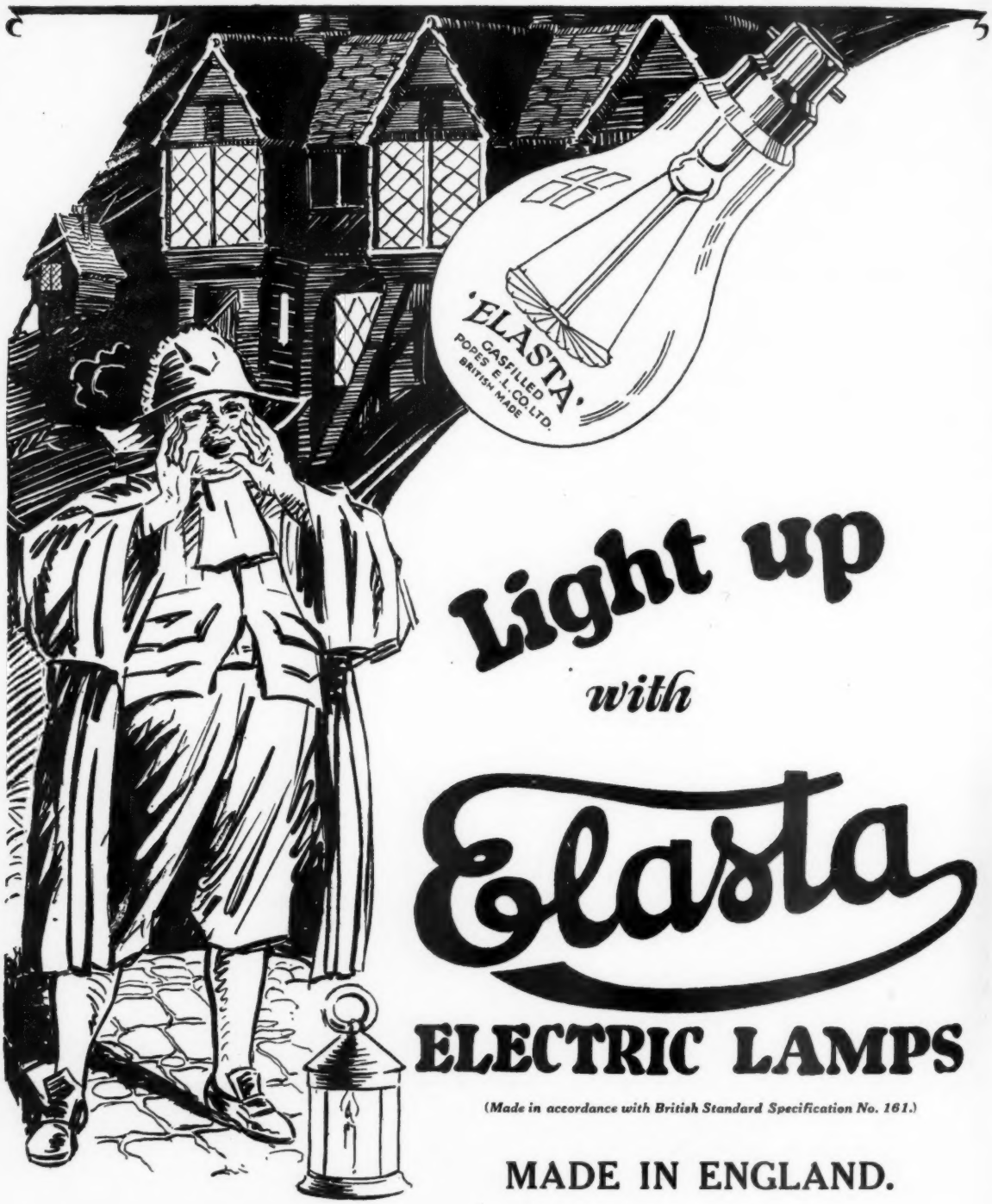

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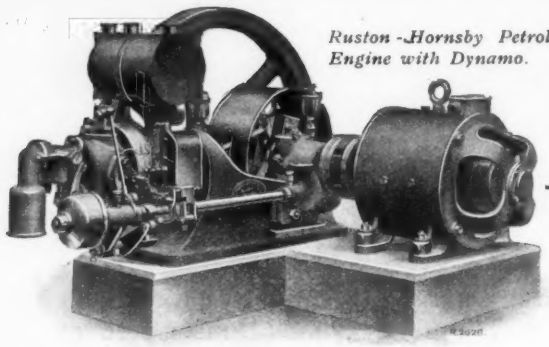

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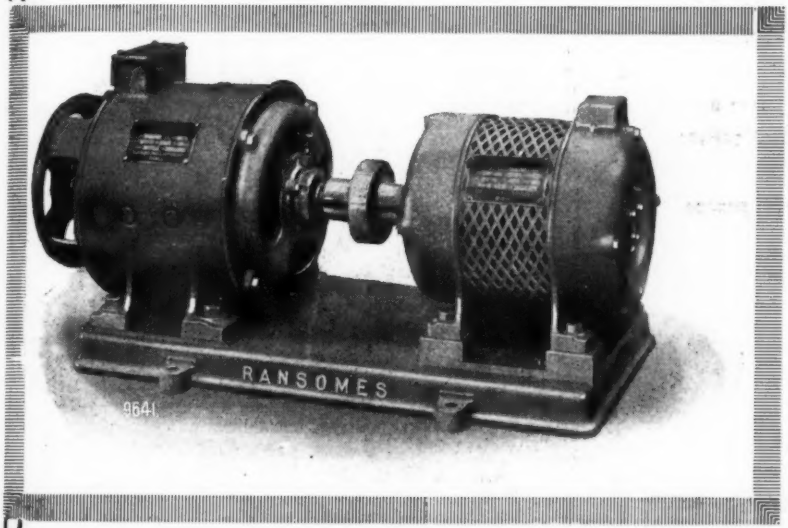

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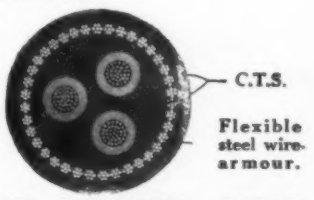

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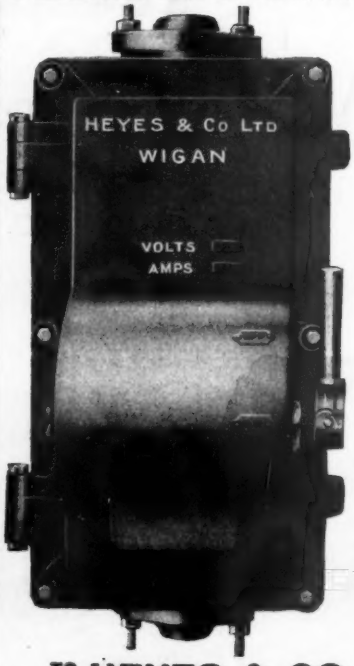

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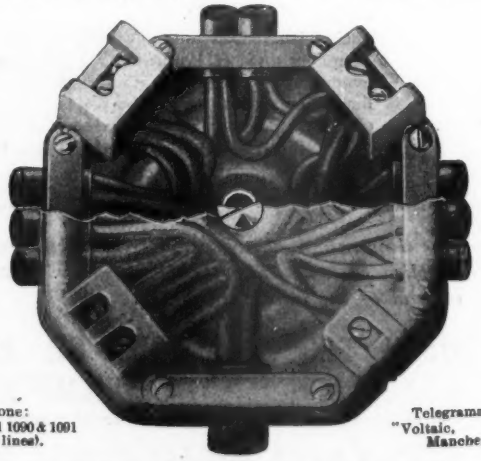

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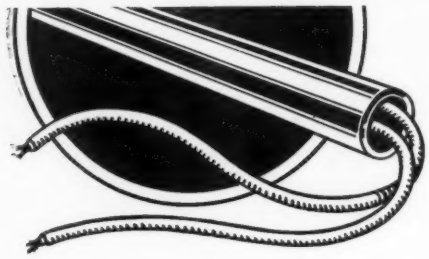

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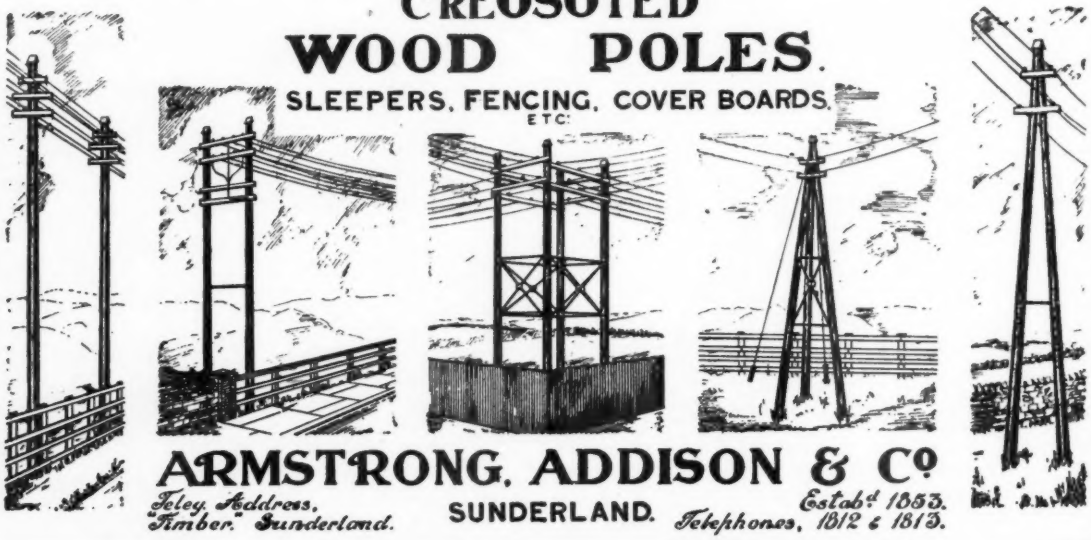

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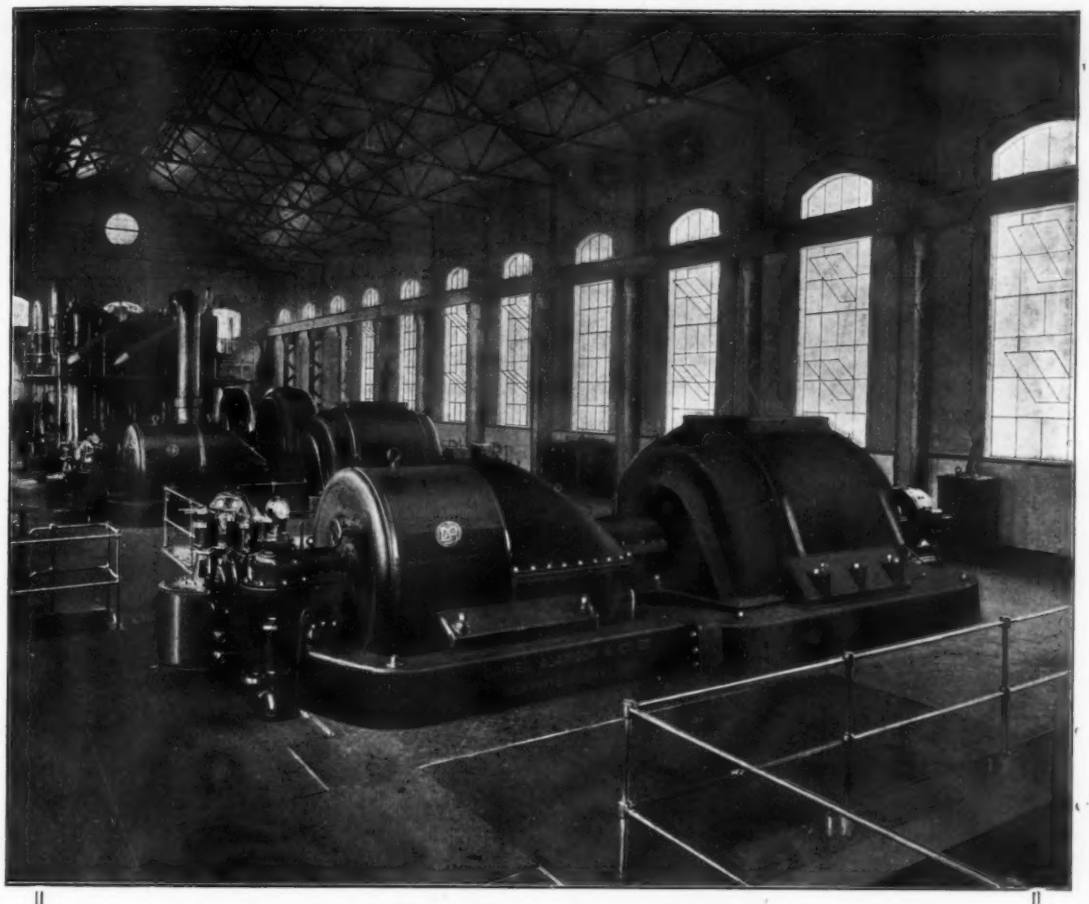

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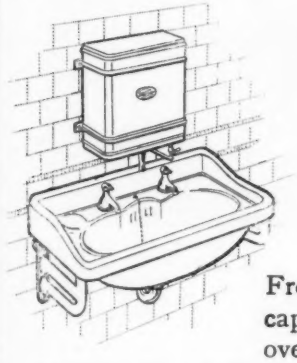

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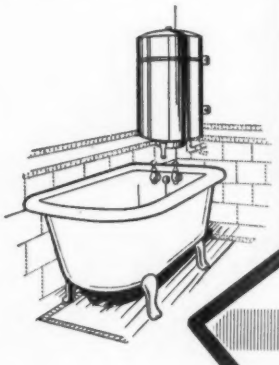

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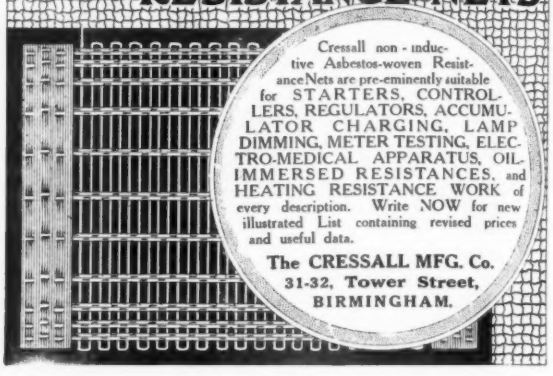

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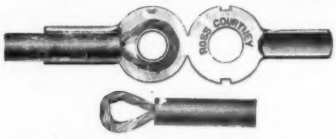

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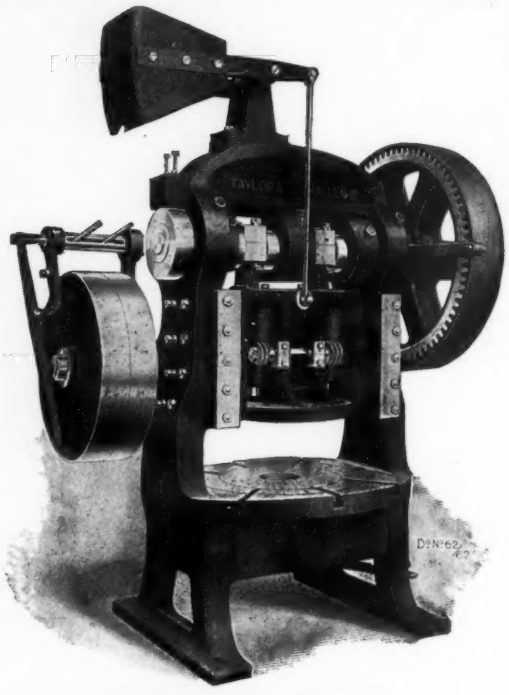

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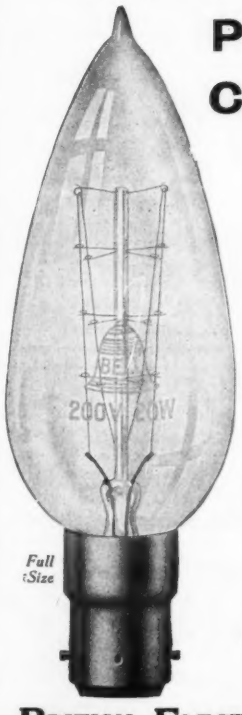

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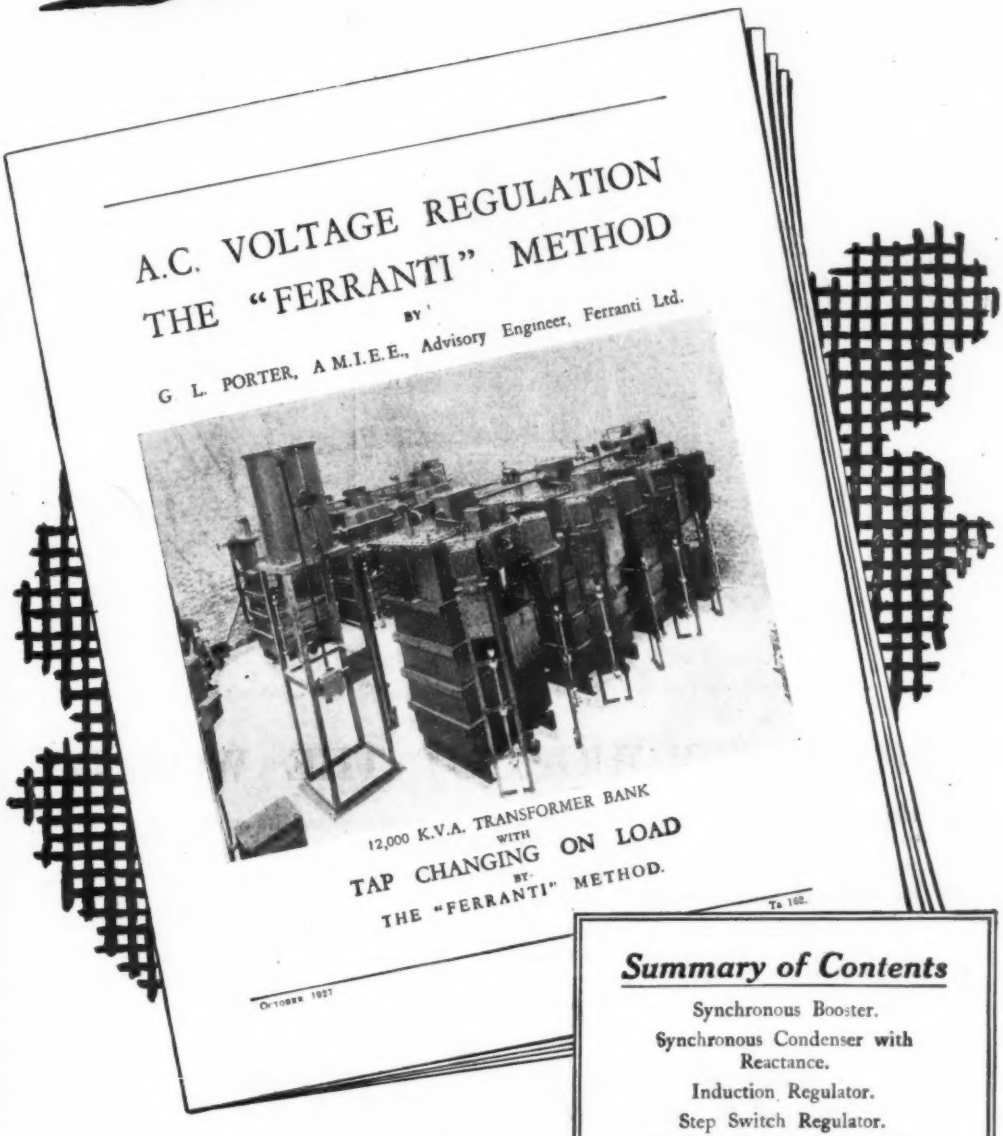

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Size of Step.
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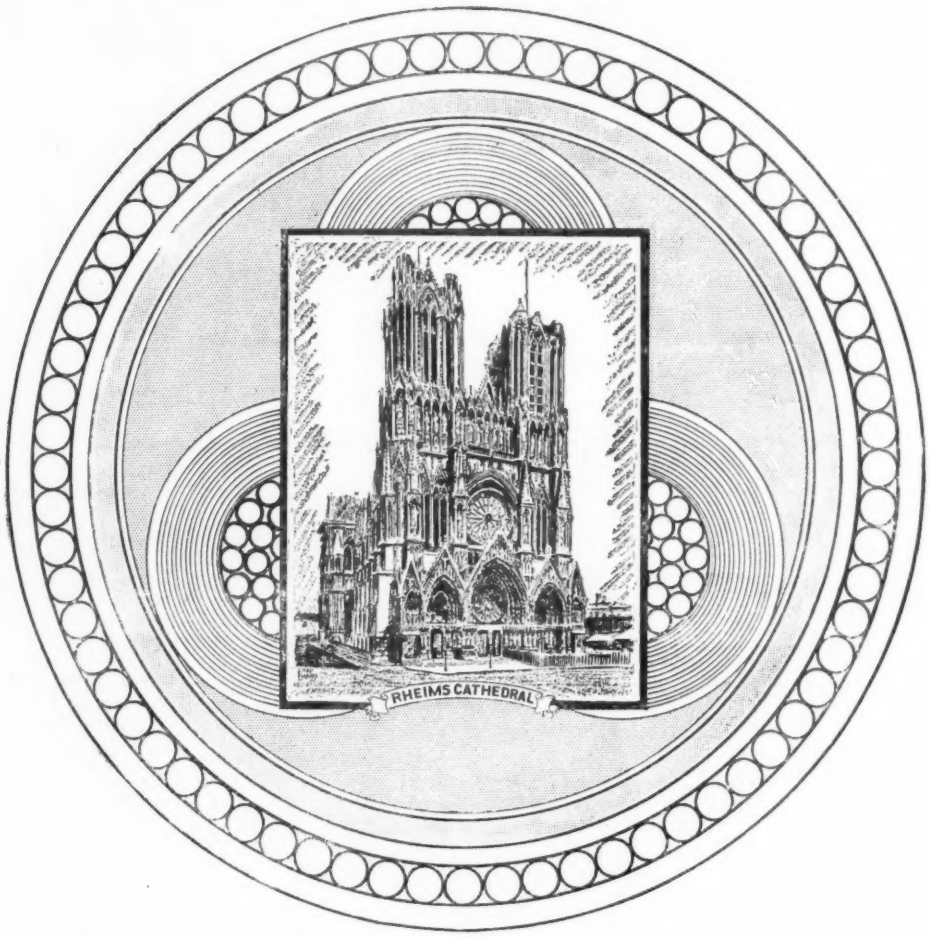

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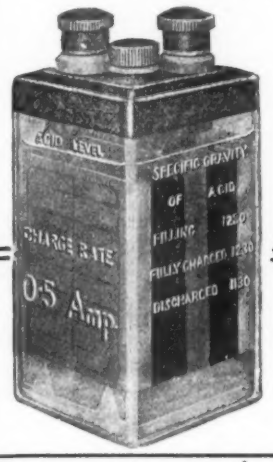

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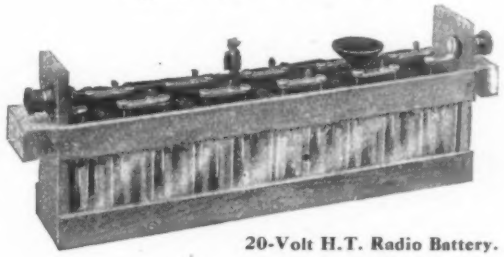

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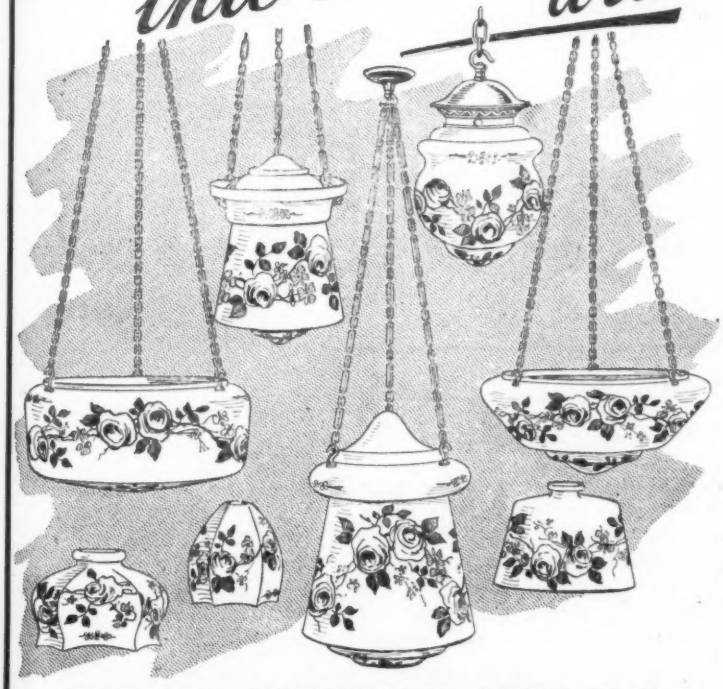

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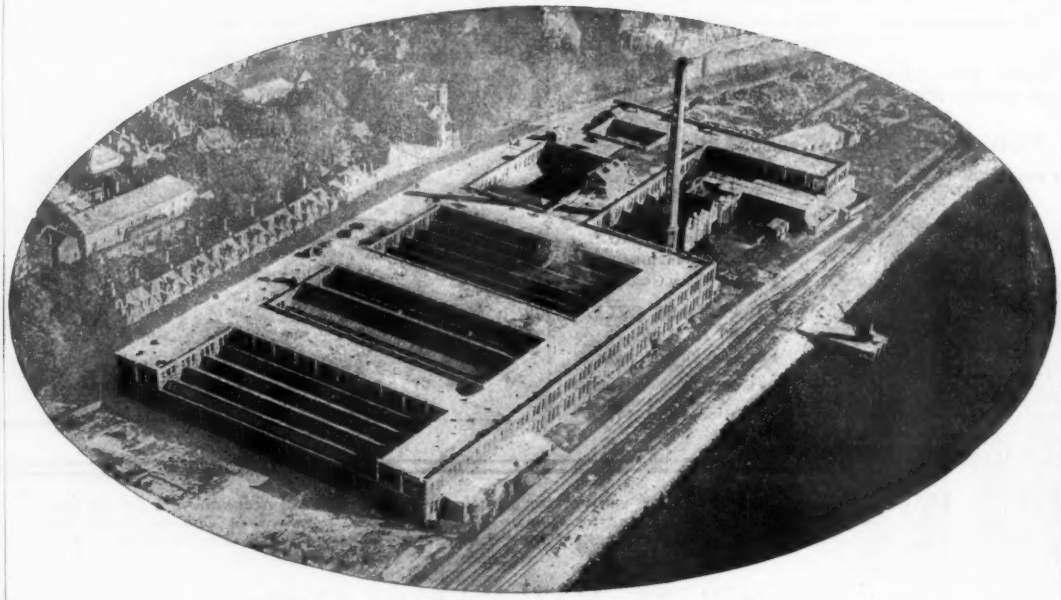

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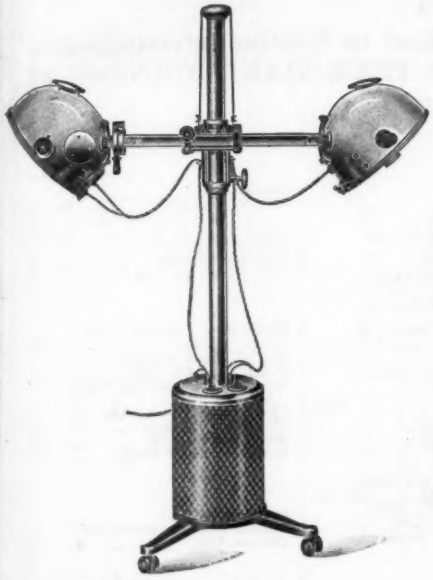

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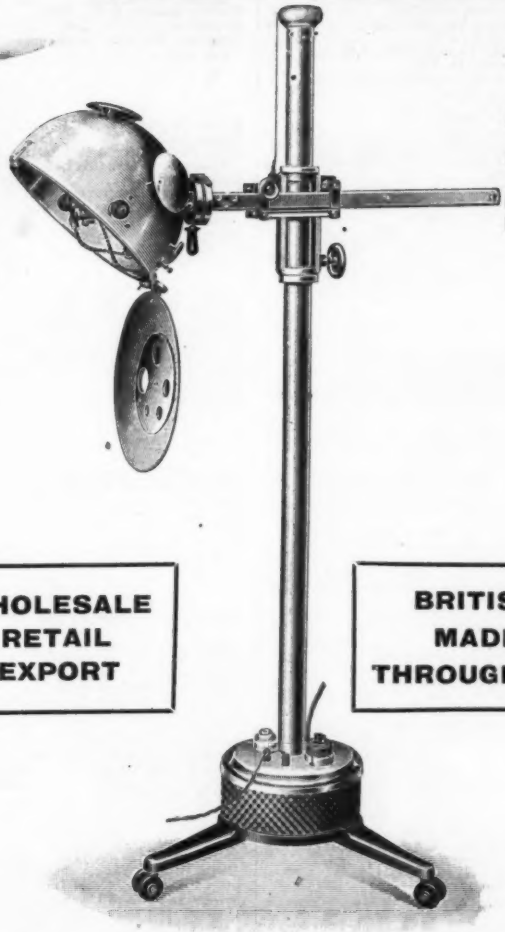

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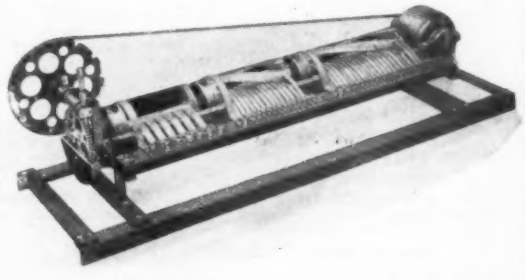

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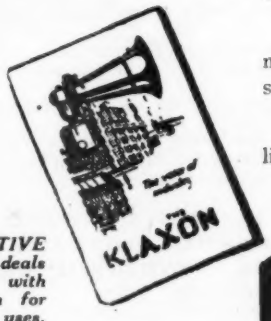

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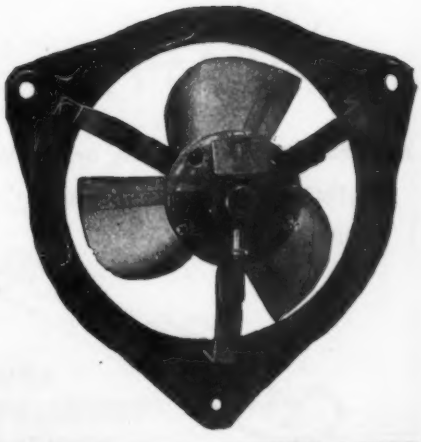

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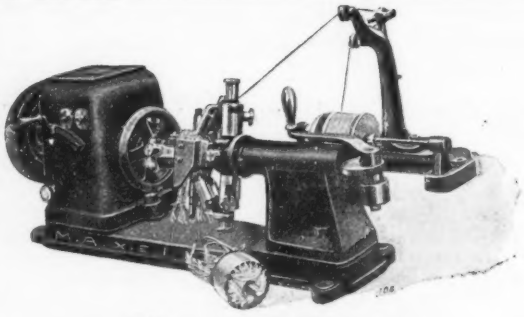

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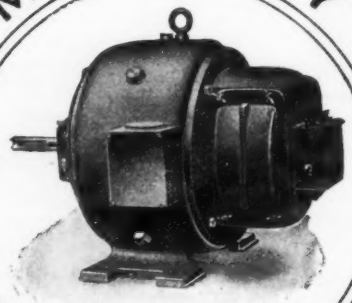

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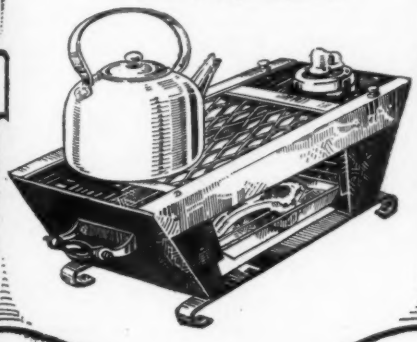

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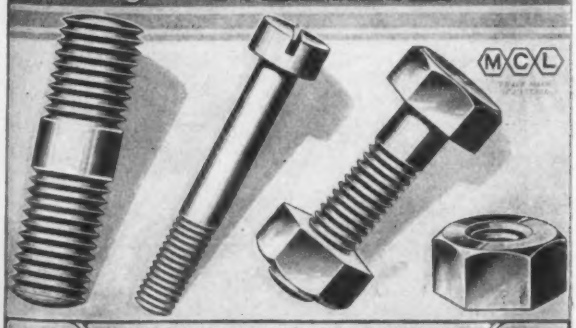

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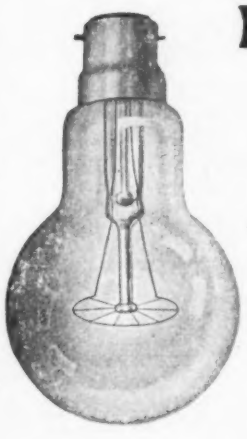

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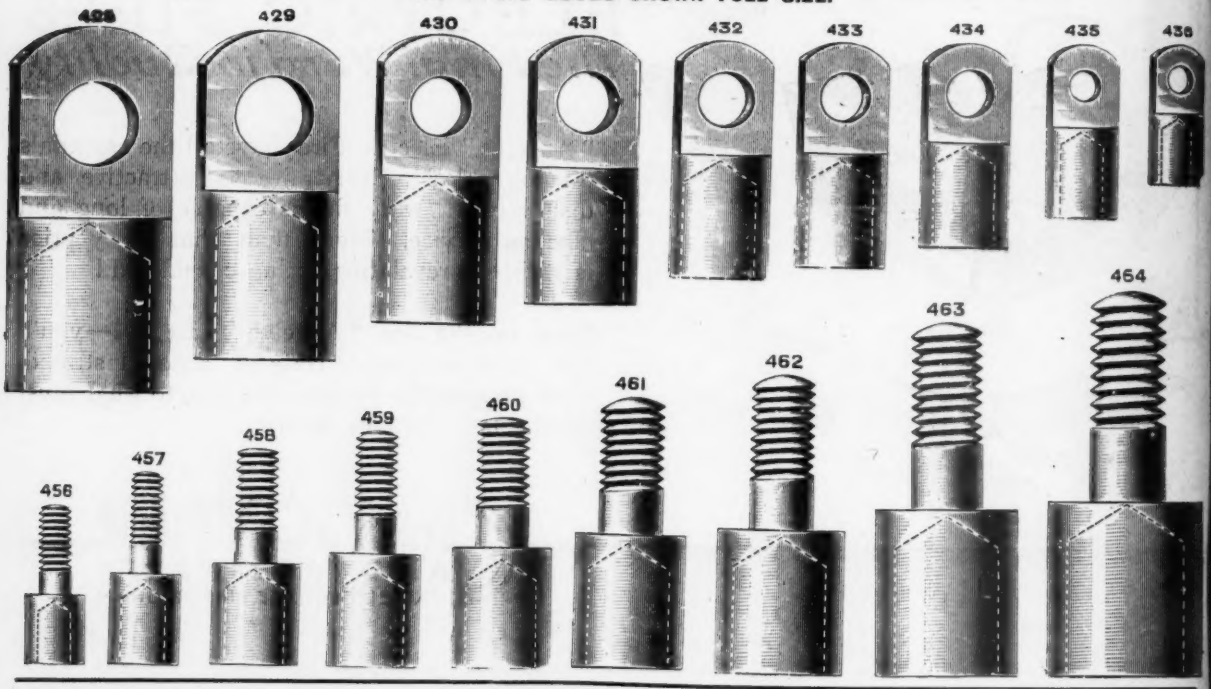

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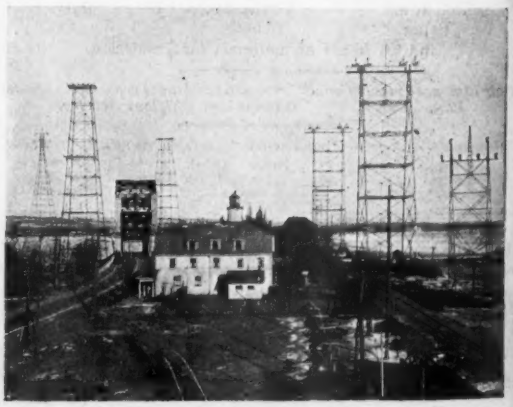

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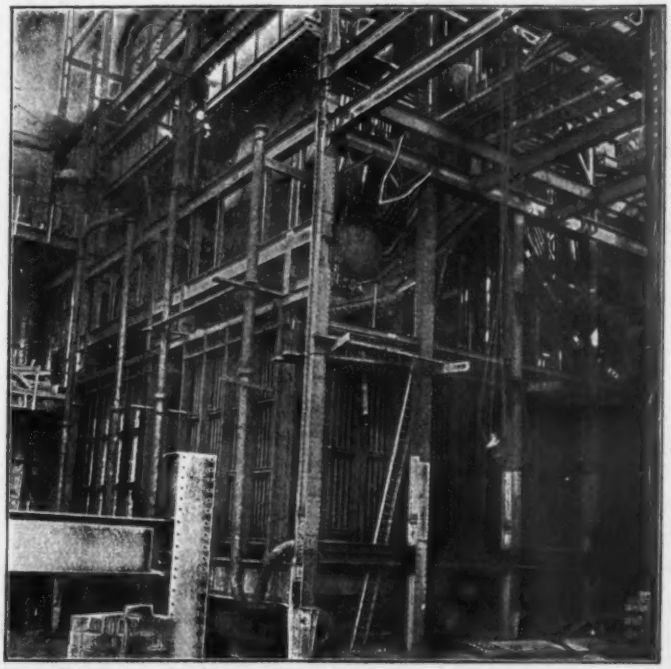

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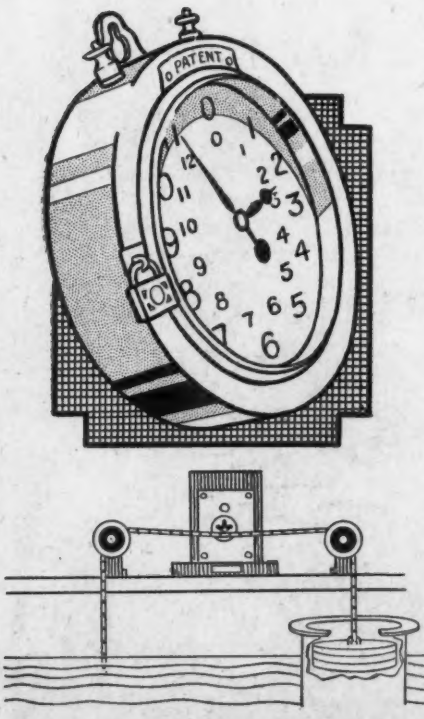

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Printed by THE PREMIER LINOTYPING AND PRINTING CO., LTD., 21-26, Dean Street, Fetter Lane, E.C. 4, and Published by